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The Mechanics of

SUPPLY-DEMAND ADJUSTERS

for

MIDWESTERN MILK MARKETS

NORTH CENTRAL REGIONAL PUBLICATION 134

ltural Experiment Stations of Illinois,
a, Iowa, Kansas, Kentucky, Michigan,
sota, Missouri, Nebraska, North Dakota,
South Dakota, and Wisconsin, and the
Department of Agriculture cooperating.

BULLETIN 684

UNIVERSITY OF ILLINOIS
AGRICULTURAL EXPERIMENT STATION

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FOREWORD

Since World War II, supply-demand adjusters have been incorporated into many federal milk marketing orders. In different markets the automatic price adjustments they provide are regulated by a variety of provisions. Performance of adjusters varies; some appear to operate more effectively than others.

Few research findings are available to guide producer organizations, handlers, and other interested parties in the evaluation of adjusters. The North Central Regional Committee on Dairy Marketing Research undertook this study to describe the characteristics of the various types of adjusters, to relate the characteristics of an adjuster to its behavior, and to provide other information that may be helpful in determining desirable specifications for a supply-demand adjuster for a particular market.

The cooperation of the United States Department of Agriculture and of milk market administrators in the intensively studied markets in supplying needed information is gratefully acknowledged. Basic data for the markets studied in detail were obtained by members of the subcommittee. Mrs. Patricia Barham and Mrs. Vivian Ytterhus did most of the statistical work involved in the analysis. Members of the regional committee offered helpful suggestions for the analysis and presentation of the data.

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Urbana, Illinois, April, 1962

The Mechanics of Supply-Demand Adjusters for Midwestern Milk Markets

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and John B. Roberts

Supply-demand adjusters are devices employed in many federal order markets to adjust Class I[1] prices in response to changes in the relationship between receipts of milk from producers and quantities used in fluid milk, fluid cream, and other Class I products.[2]

A major automatic pricing mechanism that operates with supply-demand adjusters is the variation in the blend price[3] from month to month that is associated with changes in the proportions of the milk going into utilization categories that return different prices to producers. In the Midwest, where prices for milk going into fluid use as well as for surplus milk are related to manufacturing milk prices, use-class prices are affected by changes in market prices for major manufactured dairy products, such as butter, cheese, evaporated milk, and non-fat dry milk. Changes in the amount of the differential above manufacturing prices paid for milk for fluid use, including seasonal variations in that differential, also influence Class I prices in these markets.[4]

Supply-demand adjustments are used along with these other price-determining factors to give added consideration to local conditions that it was believed should affect prices in individual markets. They are intended to supplement other price determinants to bring about timely responses in price to changes in that particular market in the relationship between receipts of milk from producers and Class I sales.

A major objective of the U. S. Department of Agriculture in using these adjusters has been to help keep supplies of milk in line with

[1] In a few markets, supply-demand adjusters affect Class II as well as Class I prices.

[2] Products in which milk usage is considered in computing the ratio vary somewhat among markets. In Chicago, some of the usage taken into account is in products which in that market are in Class II. In this bulletin, the usage referred to is commonly termed "Class I sales."

[3] The blend price is the uniform price paid to producers for their milk. It is the average price paid per hundredweight for all milk in the pool.

[4] This differential, which quite commonly is added to a formula price used to approximate the price of manufacturing milk, is commonly termed the Class I differential.

needs in a particular market. Supply-demand adjusters, according to the USDA, reduce prices when necessary without the need for cooperative management to request hearings to lower prices. Although the use of these adjusters does not eliminate the need for hearings to revise prices, their use does reduce the frequency of hearings. In the USDA's view, adjusters also make it less necessary for the USDA to prejudge the need for price hearings in federal order markets.

History of Use of Supply-Demand Adjusters

Supply-demand adjusters for federal milk order markets were first used in Boston in 1948, when an economic formula was used for pricing milk. A supply-demand adjuster was provided to raise the price of milk above the level prescribed by the formula if receipts from producers fell below an indicated minimum relationship to Class I sales, and to lower the price of milk if supplies exceeded an indicated maximum relationship.[1]

Supply-demand adjusters were soon included in the provisions for pricing milk in Midwestern markets. Adjusters became effective in St. Louis in 1949, and in Chicago, Detroit, and Milwaukee in 1951. Class I prices in Midwestern markets were established at differentials over manufacturing milk prices. By using an adjuster under such conditions, the USDA indicated belief that relating the price of Class I milk to the price of manufacturing milk was not, in itself, adequate to maintain the desired balance between receipts from producers and Class I sales on individual markets.

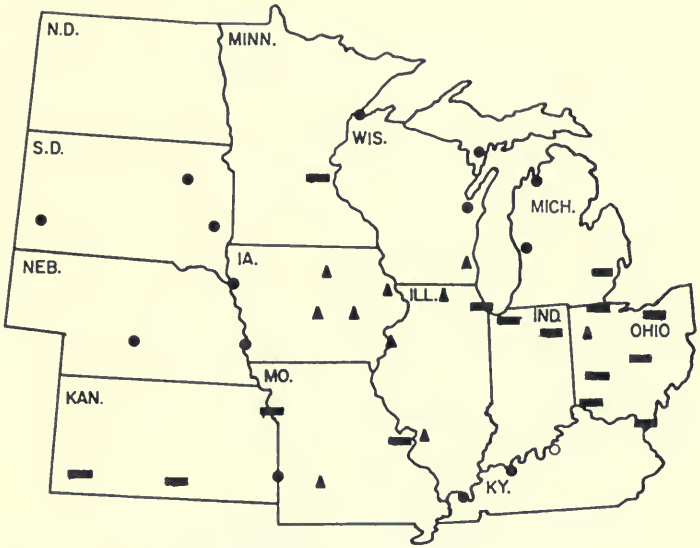
By November, 1960, the Class I prices in 51 of the 80 federal milk marketing areas then regulated in the United States were affected by supply-demand adjusters that were either in their own orders or else in the orders of other markets on which their prices depended.[2] At that time, 15 federal order markets in the North Central states and Kentucky had their own adjusters. These markets were:

Chicago	Southern Michigan	Cincinnati
St. Louis	Northeastern Ohio	Tri-State[3]
Kansas City	Minneapolis-St. Paul	Columbus
Wichita	Dayton-Springfield	Toledo
Ft. Wayne	South Bend-La Porte	Southwest Kansas

[1] Boston Milkshed Price Committee, A Recommended Basis of Pricing Class I Milk in the Boston Market, processed, Boston Milk Market Administrator, September, 1947, pages 46-48.

[2] Markets considered as using supply-demand adjusters excluded Louisville-Lexington, in which one had been specified but was not yet effective.

[3] Part of the Tri-State marketing area lies outside the North Central states and Kentucky.



Use of supply-demand adjusters in determining milk prices in federal order markets in North Central Region, November, 1960. (Fig. 1)

Ten additional markets in the region used Class I prices that were related to the price established in one or more of the 15 markets using supply-demand adjusters.[1] In these markets, most of which used prices related to the prices established under the Chicago order, supply-demand adjusters were indirectly effective. Fifteen other markets, mostly in the northern and western parts of the Region, did not have supply-demand adjusters of their own or prices that depended on those established in markets that had supply-demand adjusters[2] (Fig. 1).

[1] In one of those markets, Ozarks, the Class I price is dependent upon that in St. Louis, 9 months of the year.

[2] The Class I price in one of these markets, Neosho Valley, is maintained within specified limits of prices in Oklahoma Metropolitan, which uses an adjuster, and in Ozarks, which has a price indirectly affected by the St. Louis adjuster.

Purpose of the Study

The supply-demand adjusters used in federal order markets differ considerably in mechanics and in behavior. Some of the recent criticisms of adjusters may stem from faults in behavior that perhaps could be remedied by changing specifications for them.[1] This study was made to improve understanding of how adjusters work. Its objectives were:

1. To describe the various types of supply-demand adjusters in use in federal order markets of the North Central states and Kentucky.
2. To examine the movement of the major types of adjusters and to analyze the effect of differences in the characteristics of the adjusters on their movement.
3. To provide other helpful information for appraising an adjuster for a particular market.

SUPPLY-DEMAND ADJUSTERS IN FEDERAL ORDER MILK PRICING

Why Used

Legal authority for the regulation of milk marketing under federal milk orders rests in the Agricultural Marketing Agreement Act of 1937 as amended (7USC 601). This act states that it is the policy of Congress to establish prices for milk that will reflect the price and supplies of feed and other economic conditions affecting the supply and demand for milk in the regulated marketing area. The USDA, which regulates the marketing of milk under the authority of the Act, has interpreted its price-setting responsibilities in these terms:

"The primary standard for establishing Class I prices under the Act is the concept of equating the supply with the demand for milk in the marketing area. The 'price of feeds, the available supplies of feeds, and other economic conditions' referred to in the Act are taken into account as they affect prospective market supply and demand conditions. The 'public interest' is served by an adequate supply in terms of a reasonable price.

"Formula pricing plans have been developed to establish and maintain Class I prices in accordance with these objectives. . . . Although formulas . . . are effective in bringing about many of the price changes needed in fluid milk markets, developments in the production of milk and market sales often require changes in the relationships between milk prices and

[1] Feddersen, Howard C., The Supply-Demand Provisions in Federal Milk Marketing Orders, mimeographed copy of talk given at the Seventh Annual Dairy Industry Conference, University of Arizona, January 15, 1958, page 1.

the selected formula factors. An indicator which has helped to call attention to the need for such adjustments in pricing methods is the comparison of Class I sales with the total supply of producer milk available in a current period, as compared to some normal or standard relationship of Class I sales to supply."[1]

Although pricing of milk for fluid use is oriented toward conditions in a particular marketing area, intermarket movements of milk can be expected if the price in that market gets out of line with prices in other markets. The USDA has pointed out the consequences of such price disparity:

"The level of Class I price in any market generally cannot exceed for any length of time the cost of buying the milk in another supply area and transporting it to the consuming market. If a price advantage exists long enough for handlers to recognize the advantages of another supply, they will change their buying arrangements. One of the most important guides to the proper level of Class I prices in any given market is the cost of alternative supplies."[1]

A supply-demand adjuster affects prices in a local market or in a group of closely related markets. In doing this, it also influences price relationships between markets. Consideration should therefore be given to maintaining reasonable intermarket price differentials when using supply-demand adjusters.

Three types of surplus milk may be found in fluid milk markets. First, seasonal surpluses, resulting mainly from seasonal changes in the quantity of milk received from producers, are large in many markets. Second, day-of-the-week surpluses, resulting mainly from increasing day-to-day variations in the quantities of packaged milk sold, are of growing consequence. Third, there may be more or less year-round surplus that represents a general excess of supplies over Class I sales plus seasonal and short-term surpluses.[2]

Supply-demand adjusters are employed to regulate the volume of year-round surplus (if the market has one) and also to cope with shortages. Despite differences in characteristics and in behavior, the purpose of all supply-demand adjusters is to help maintain a "normal" ratio of producer receipts to Class I sales on a year-round basis.

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[1] Dairy Division, Agricultural Marketing Service, U.S. Department of Agriculture, Federal Milk Marketing Orders — Their Establishment, Terms and Operation, U.S. Dept. Agr. Misc. Pub. 732, October, 1956, page 23.

[2] Williams, Sheldon W., and Kerchner, Orval G., Disposing of Surplus Fluid Milk in Midwestern Markets, Nor. Cen. Reg. Pub. 113, Ill. Agr. Exp. Sta. Bul. 664, September, 1960, pages 5-6.

Concept of Normal Supply

To provide for a supply-demand adjuster in a market order, the USDA has taken a past or existing relationship between producer receipts and Class I sales of milk in that market as the point of departure. Thus the standard utilization percentage or percentages[1] employed usually allow for the proportion of surplus milk that has been carried on that market, not only as seasonal and short-time surpluses, but also as year-round surplus. Supply-demand adjustments are intended to reduce Class I prices only as the percentage of surplus goes above this normal or base proportion, or add to the Class I price only as the percentage of surplus falls below that level.

This normal relationship that serves as the basing point in a supply-demand adjustment is not the same in all markets. Relative proportions of surplus milk vary among markets and these differences help to account for the variation in standard utilization percentages. Other differences also are involved. A market like Chicago, which provides emergency supplies of milk to other markets in periods of short production, needs a wider margin of receipts over fluid sales than a market which carries relatively little excess, such as Milwaukee or Toledo.

Determining which standard utilization percentage to use also involves determining which markets to include in that standard. If supply or sales areas overlap, independently computed adjusters may not be satisfactory in markets that are comparatively close together. Consequently "in some regions where a single pattern of Class I prices appears to be appropriate the Class I prices for a number of markets are calculated in terms of one supply-demand adjuster. The adjuster may be computed in terms of the combined receipts and Class I sales in all markets of the region or in terms of the principal market whose price tends to dominate the region."[2]

For example, before the Cleveland and Akron-Stark County orders were consolidated, their supply-demand adjusters were computed on the basis of the combined receipts and Class I utilization under both orders. Similarly, Milwaukee and a number of other markets in the general area have used Class I prices that depend on the Chicago Class I price and thus reflect the effect of Chicago's supply-demand adjuster.

[1] Standard utilization percentage refers to the annual or 2-month ratio of producer receipts to fluid sales, or vice versa, used as a basing point in computing the amount and direction of supply-demand adjustments.

[2] Dairy Division, Agricultural Marketing Service, U.S. Department of Agriculture, Federal Milk Marketing Orders — Their Establishment, Terms and Operation, U.S. Dept. Agr. Misc. Pub. 732, October, 1956, page 23.

Successful use of another market's supply-demand adjuster depends on considerable similarity of market conditions. Use of the Chicago supply-demand adjuster in Minneapolis-St. Paul lasted only 19 months. Producers in Minneapolis-St. Paul objected to continuing the arrangement, because they maintained that there were pronounced differences in supply conditions in the two markets.

Although supply-demand adjustments are intended to maintain indicated supply-demand relationships, it should be recognized that pronounced and lasting changes in the seasonal pattern of supplies or in the day-to-day pattern of sales of packaged milk may occur. Review of the standard ratio is needed for such changes. For example, a large increase in day-of-the-week variation in sales, such as might accompany a pronounced shift to store sales, might require carrying somewhat larger reserves of milk than previously.

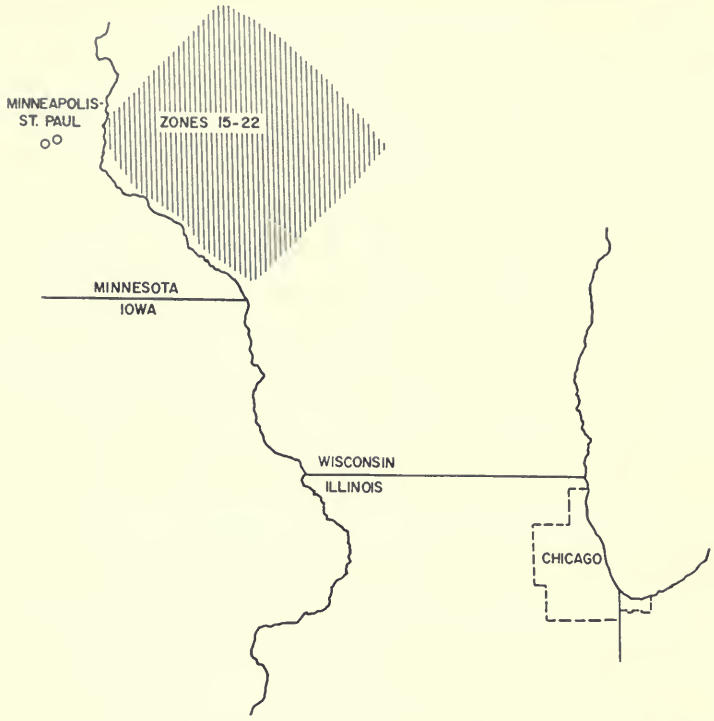
RESPONSE IN MARKET SUPPLIES OF MILK

The extent to which a supply-demand adjuster affects the balance between producer receipts and Class I utilization of milk appears to depend largely on how effectively the adjuster shifts milk between the fluid market concerned and alternative outlets, particularly for fluid milk. Of course, by affecting price, the adjuster may have a little influence on the quantity of milk supplied by producers and on fluid milk consumption in the market.

With minor exceptions, supply-demand adjusters operate directly only on the price of that milk used in packaged milk and cream. Consequently their effect on the blend price paid the farmer is less than their effect on the Class I price. For example, in Chicago and Detroit where, in most of 1959, adjusters were deducting the maximum amounts permitted by order specifications, the respective reductions were 4 percent and 8 percent of blend prices as compared with 6 percent and 11 percent of Class I prices. To illustrate the possible effect of changes in the blend price of that magnitude on production, we might apply the rate of response indicated in a recent study of the effect of price on milk production.[1] Results suggest that over the long run (periods of more than a year) the response in production to price reductions of the extent described might be on the order of 1 to 4 percent.

Any direct effect of supply-demand adjustments on milk consumption also appears to be slight. Effects of adjusters on the Class I price of the extent mentioned (−24 cents in Chicago; −44 cents in Detroit)

[1] Halvorson, Harlow W., The Response of Milk Production to Price, Jour. Farm Econ. 40:1101-1113, December, 1958.



Location of zones 15-22 of Chicago milkshed. **(Fig. 2)**

are equivalent to changes in the price per quart of about ½ cent and 1 cent, respectively. These reductions in the consumer price would be roughly 2 percent and 4 percent. Many studies indicate that milk consumption responds much less than proportionally to changes in price.[1] These data suggest that price changes attributable to supply-demand adjusters are therefore unlikely to have much effect on milk consumption.

A study of changes in quantities of milk supplied to the Chicago market in the outer zones of the milkshed suggests how price changes may shift supplies of milk between markets. These zones (15-22) include a supply area in northwestern Wisconsin that is from 265 to 385 miles from Chicago (Fig. 2). Considerable manufacturing milk is processed in the area and limited alternative outlets for Grade A milk have been developed. The area is much closer to Minneapolis-St. Paul than to Chicago and is a potential source of supplies for the Twin Cities market.

[1] For example, see Rojko, Anthony S., The Demand and Price Structure for Dairy Products, U.S. Dept. Agr. Tech. Bul. 1168, pages 88-112, 1957.

Since this area is distant from Chicago, producer blend prices generally are less above manufacturing prices there than in most other parts of the Chicago milkshed. Consequently the quantity of milk supplied to the Chicago market from these zones probably is more responsive to comparatively small changes in price than the quantity supplied to the market from closer zones. This is because milk plants in these zones, rather than plants closer to the market, are more likely to find alternative markets that are as attractive as Chicago.

The difference between the Chicago blend price in zone 18 and the Class IV (butter-powder) price averaged 27 cents per hundredweight during the period 1944 to 1960.[1] Because the difference fluctuated widely from month to month, a 12-month moving average was used to show trends.[2] As indicated by this 12-month average, the differential was above the 16-year average in 1946, 1948, 1951-1952, and 1956; below the average in 1944 and early 1945, late 1947, 1949-1950, late 1953 till mid-1955, and 1957-1959 (Fig. 3).

The volume of milk for the Chicago market received in those zones varied seasonally and also showed cyclical swings of several years' duration. The 12-month moving average of those supplies showed a long upswing in 1947 and 1948, a moderate increase about 1952, and a gradual increase in 1957 and 1958. Declines occurred in 1950 and in 1954.

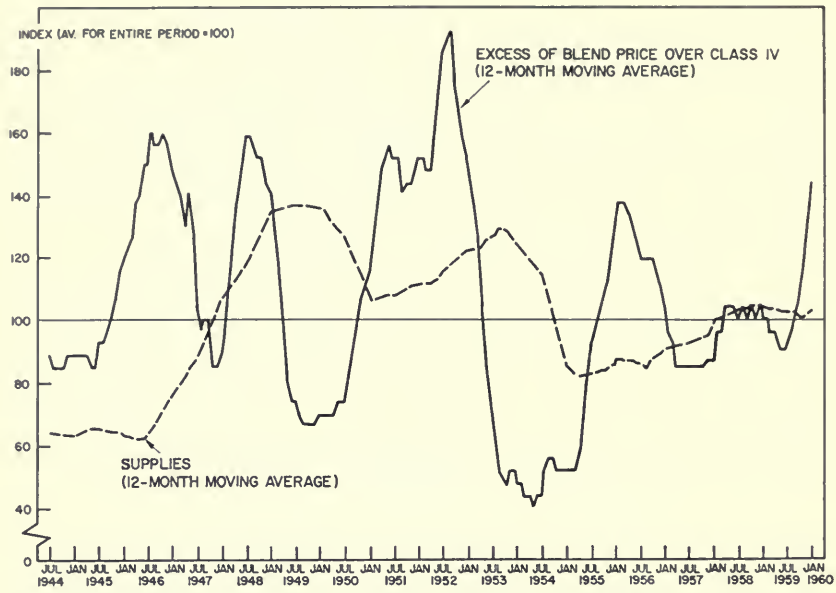
Although adjustments in supplies available for Chicago were not closely associated with changes in the differential, there was a relationship between them. If the supplies curve is advanced 18 months, the major upward and downward movements correspond fairly close with major movements in the price differential (Fig. 4).[3] Although supplies showed a definite tendency to respond to changes in price relationships, it took from one to two years for the response to take place. Since other influences also were at work, including a gradual increase in supplies, the relationship was not close.[4]

[1] Price comparisons for the area were based on the difference between the Chicago blend price for the 18th (310-325 mile) zone and the Chicago Class IV price, which approximates prices paid for manufacturing milk in the area. This comparison allows for the higher cost of shipping milk to Chicago from this area than from areas closer to the city.

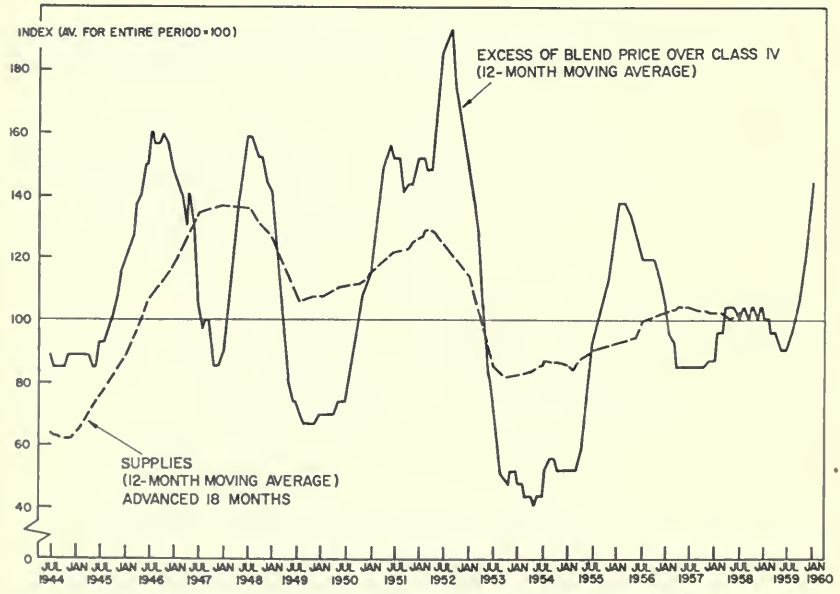
[2] The average for the 12-month period is plotted opposite the seventh month in the period.

[3] The coefficient of correlation between the two series was slightly higher with an advance in supplies of 18 months than with an advance of 24 months, and considerably higher than with advances of 12, 6, or 0 months.

[4] Although the actual quantity of Chicago milk originating in these zones increased over the period, the percentage of the market's supplies obtained from these zones declined from 4.3 in 1945 to 3.7 in 1959.



Index numbers of 12-month moving averages of the difference between the 18th zone blend price and Chicago Class IV price and producer deliveries in zones 15-22 of the Chicago milkshed, 1944-1960. (Fig. 3)



Index numbers of 12-month moving averages of the difference between the 18th zone blend price and Chicago Class IV price and producer deliveries in zones 15-22 of the Chicago milkshed advanced 18 months. (Fig. 4)

Decisions made by plants contributed much to the wide fluctuation in supplies from these outer zones. In the late forties, mainly from 1946 through 1948, five plants entered the Chicago pool in zones 15-22. Most of the expansion of supplies apparently was due to the influx of these plants.

One of these plants left the Chicago market in 1950. Between 1954 and 1956, three more left the Chicago market and the other began marketing part of its Grade A supplies elsewhere. Another plant, which had shipped to Chicago longer, also left the market in this period. Most of these changes occurred when the excess of the Chicago blend price in the 18th zone over the Chicago price of Class IV manufacturing milk was below average.

Milk from two of the plants in this area which left the Chicago market in the 1954-1956 period, and from that part of the area's supplies diverted by a third, was shifted to the Minneapolis-St. Paul market. These changes were induced because, from 1953 to 1956, blend prices in this area averaged about 30 cents per hundredweight more for the Minneapolis-St. Paul market than for Chicago.

The other plants in these zones that left the Chicago market in 1950 and in 1954-1956 did not sell milk regularly on any large fluid markets. Most of them provided supplementary supplies of fluid milk to other markets as needed, but manufactured the greater part of their milk in the season of flush production. With reduced premiums over manufacturing prices obtained from the Chicago pool, managers of those plants believed that they were able to pay producers a little more by marketing their milk in this way than they could by continuing on the Chicago market.

These data for the outer zones of the Chicago milkshed show that some of its plants did shift to other markets in response to changes in price relationships. In this instance, the market's milk supplies responded to price changes, indicating a supply-demand adjuster could help to bring milk receipts more in line with needs. Because alternative markets for milk are quite competitive in these outer zones, the response of milk supplies to changes in price may be greater there than in other areas.

If delays in the response of milk supplies to changes in price as indicated by these Chicago outer-zone data are characteristic, the use of highly fluctuating adjusters is undesirable. An adjuster that changes frequently, and by comparatively wide intervals, may not sustain an indication of a changed relationship enough to convince plant management that an adjustment is in order. If supplies do respond promptly

to price changes, marked changes in a supply-demand adjustment will bring about more timely adjustments than moderate changes that extend over a longer period. Definite examples of prompt response by milk supplies to price changes, however, were not found in these data or elsewhere in the study.

DESCRIPTION OF SUPPLY-DEMAND ADJUSTERS

In using a supply-demand adjuster, the USDA compares the relationship between producer receipts and Class I sales in a specified period with a prescribed standard ratio. If the existing ratio of receipts to Class I sales differs from the standard ratio, the Class I price is varied by a computed supply-demand adjustment. This adjustment reduces the price to producers when supplies exceed the prescribed relation to fluid milk sales, and raises the price when supplies are short. The receipts-Class I sales ratio used as a standard and the amount of the adjustment per point of deviation between the standard and the actual receipts-Class I sales ratio obviously influence the character and size of the adjustment. The total amount of the adjustment is commonly limited, though the limits vary among markets. The adjuster may be computed either on the basis of a uniform amount per point of deviation or by brackets. The adjustment is also influenced by the length of the base period used and by whether the ratio is expressed as the quotient of Class I sales divided by producer receipts or as the quotient of producer receipts divided by Class I sales.

The behavior of a supply-demand adjuster depends on its characteristics in terms of these various features. The effects of differences in each of these respects on the supply-demand adjuster is discussed briefly in the following section. One must bear in mind that differences in one characteristic may be offset by compensating differences in another. For example, by modifying the rate of adjustment, it is possible to offset, or more than offset, the effects of a reversal of the numerator and denominator in computing the ratio between producer receipts and Class I sales.

Characteristics

Length of base

Adjusters commonly have bases either of 2 months or of 12 months. Adjusters with 2-month bases are more sensitive to changes in relationships between producer receipts and Class I sales, including short-term changes, than are adjusters with 12-month bases. Even though

short-base adjusters are used in conjunction with standard utilization percentages that take into account the normal seasonal pattern in the receipts-Class I sales relationship for that market, they also are affected by abnormalities and shifts in that seasonal pattern. Adjusters using 12-month bases largely avoid this difficulty.

Manner in which ratio is computed

The ratio between producer receipts and Class I sales may be computed either as the quotient of receipts divided by sales or as the quotient of sales divided by receipts. If producer receipts are considerably in excess of Class I sales, with a given change in the relationship the quotient of receipts divided by sales will vary by an appreciably larger number of percentage points than will the quotient of sales divided by receipts.[1] For instance, assume a market selling 25 million pounds of Class I milk monthly in which producer receipts change from 35 million pounds in a given month of one year to 40 million pounds in the same month a year later. Monthly ratios for the two years computed in the two ways would be:

	Receipts divided by sales	Sales divided by receipts
First year	140 percent	71 percent
Second year	160 percent	62 percent
Change	20 points	9 points

The ratio obtained by dividing sales by receipts expresses the relationship in the form in which utilization ratios are commonly published in statistical reports. Also, because the ratio thus computed responds more to a given change in supplies when receipts approximately equal sales than when receipts considerably exceed sales, it has the possibly desirable attribute of being a little more sensitive when supplies are short than when they are long.

[1] With the quotient computed by dividing Class I sales by producer receipts, a given change in the quantity of receipts changes the ratio by less and less as receipts increase relative to sales. In practice this effect is not pronounced over the usual range in the ratio in a particular market. The problem of the differences obtained depending on the manner in which the ratio is computed can be resolved by the use of logarithms. If amounts of receipts and of Class I sales, respectively, are converted to logarithms, it would not matter how the ratio were computed, as the quotient in either case would be the absolute difference between the two logarithms. To employ this solution, it would be necessary to use a scale of price adjustments based on the absolute values of the difference between the logarithm of producer receipts and the logarithm of Class I sales.

Accelerator or accumulator

A device termed an "accelerator" is commonly employed with a 12-month base to move the adjuster farther up or down than the 12-month moving average would in periods of either continuing upward or continuing downward movement of the ratio of producer receipts to Class I sales. Thus an accelerator causes an adjuster that uses a 12-month base to be more responsive to changes in conditions during the latter part of the 12-month period than the 12-month average would be without an accelerator.[1] The behavior of the accelerator used with the Chicago supply-demand adjuster is analyzed in the appendix.

A somewhat similar device, termed an "accumulator," is employed in some markets such as Kansas City in which the supply-demand adjuster has a 2-month base. As used in those markets, an accumulator increases the amount of the adjustment if the current ratio of milk receipts to Class I sales persistently remains either above or below normal. In conjunction with an accumulator, however, a lower than usual basic rate of adjustment is used. Thus the accumulator in reality is a decelerator designed to hold down adjustments except as the ratio of receipts to Class I sales displays a continuing deviation from normal in a given direction. In practice an accumulator has more moderating influence as adjustments increase in size (whether positively or negatively) than as they move back toward zero. These effects are illustrated in the analysis of the behavior of the Kansas City accumulator in the appendix.

Tolerance zone

In some orders specifications for the supply-demand adjuster provide a range in the standard utilization percentages within which no adjustments are computed. This "tolerance" zone, which varies in different markets from 2 to 10 points, in effect provides a range within which the ratio of producer receipts to fluid sales is considered normal.

Size of standard utilization ratio

The standard utilization ratio employed is commonly based on a normal relationship for that market between producer receipts and Class I sales (page 10). Thus the size of the ratio may vary considerably depending on how closely producer receipts have been adjusted to Class I sales historically, or on some other basis deemed appropriate by the USDA. It is important that the level of the norm employed be

[1] Neither an accelerator nor an accumulator will increase an adjustment once it reaches the prescribed limit.

properly related to the Class I differential in the market, so that the differential and the adjuster, in combination, produce an appropriate Class I price.

Rate of adjustment

The amount the Class I price is adjusted per point of deviation from the standard utilization percentage varies among markets. Naturally, with a change of a given number of percentage points, the higher the rate the larger the adjustment.

In some markets the rate of adjustment has varied with the season. For example, until recently the adjuster used in St. Louis provided for adjustments of 1 cent per point of deviation in April through June, 3 cents in September through November, and 2 cents in other months. One reason for the difference was that the Class I differential varied widely during the year.[1] In the spring, when the differential was 70 cents, adjustments at the rate of 3 cents per point could have been large in relation to the differential. In the fall, when the Class I differential was $1.45, adjustments at the rate of 3 cents per point were not excessive.

In markets where adjustments are by brackets rather than at a uniform rate per point, the adjustment per point of deviation may vary somewhat depending on the total amount of deviation. As a rule, the differences in rates of adjustment between the various brackets are not pronounced.

Limits to adjustment

In most markets where milk used in fluid milk products is priced on the basis of a formula that involves a differential over prices paid for milk for manufacture, limits are set to the amount supply-demand adjusters may add to or subtract from the Class I price. Limits are commonly the same for both plus and minus adjustments. In some cases, effective limits are set by provisions that hold the market's Class I price within specified limits of prices in one or more other markets. In general, limits are wider in markets where Class I prices are considerably above manufacturing price levels than in markets where Class I prices are close to manufacturing price levels (Table 1). This relationship reflects the need to keep fluid milk prices closer to manufacturing price levels in areas of abundant milk supplies than in areas of limited supplies.

[1] The differential is the amount added to the basic manufacturing price in determining the Class I price.

Table 1. — Relation of Limits to Supply-Demand Adjustment to Average Monthly Class I Price Differential, November, 1960[a]

Market	Average monthly Class I price differential	Limits to supply-demand adjustment[b]
Minneapolis-St. Paul	$ .86	$ .24
Chicago	.90	.24
Columbus	1.10	.38
South Bend-La Porte	1.10	.24
Fort Wayne	1.16	.41[c]
Dayton-Springfield	1.20	.38
Cincinnati	1.30	.50
Nashville	1.35	.50
Kansas City	1.35	.45
Southern Michigan	1.43	.45
Toledo	1.45	.50
Knoxville	1.50	.50
Tri-State	1.59	.38
Northeastern Ohio	1.65	.25
Chattanooga	1.75	.50
Oklahoma Metropolitan	1.85	.50
Inland Empire	1.90	.50
North Texas	2.12	.50
New Orleans	2.61	.49
Central Arizona	2.75	.50

[a] Relationship is shown for all federal order markets basing Class I milk prices on differentials above manufacturing milk prices that had independently computed supply-demand adjustments in use for which specific limits are stated.

[b] Adjustment may be either plus or minus this amount.

[c] Average. Limit varies seasonally and, for 3 months, plus and minus limits are not equal.

Classification of Adjusters by Characteristics[1]

Because adjusters may be classified on the basis of each of several characteristics, there is no one basis of classification that satisfactorily characterizes all adjusters. However, the classification in Table 2, which considers length of the base and how the ratio of producer receipts to Class I sales is computed, provides a fairly good over-all picture. The information brings out these points about the 15 adjusters in use in the North Central Region on November 1, 1960:[2]

[1] Based upon provisions in effect as of November 1, 1960. Information drawn primarily from mimeographed data prepared by Programs and Standards Development Branch, Dairy Division, Agricultural Marketing Service, U.S. Department of Agriculture under the title "Mechanics of Supply-Demand Adjusters in Federal Milk Marketing Orders."

[2] The 15 adjusters exclude that prescribed for Louisville-Lexington, which was not yet in effect, and that for Milwaukee, which uses the adjustments computed for the Chicago market.

1. Thirteen adjusters use a 2-month base, and two use a 12-month base.

2. Ratios are expressed about equally as the quotients of sales divided by receipts and of receipts divided by sales.

3. Standard utilization percentages are mainly in the range from 70 to 79 in markets where the ratio is the quotient of sales divided by receipts, and from 139 to 130 where the ratio is the quotient of receipts divided by sales.

Table 2. — Summary of Major Characteristics of Supply-Demand Adjusters in Effect in 15 North Central Markets, November, 1960[a]

	Ratio computed by dividing sales by receipts			Ratio computed by dividing receipts by sales	
	2-month base	12-month base		2-month base	12-month base
Total number of markets..	6	1		7	1
Standard utilization percentages (average for year, if monthly)					
Number of markets					
Under 70	1	...	Over 140	...	...
70-79	4	1	139-130	5	1
Over 80	1	...	Under 130	2	...
Rate of adjustment					
Uniform per point					
Number of markets	4	1		1[b]	1
Minimum adjustment	1.5¢	...		...	...
Maximum adjustment	3¢	...		...	...
Average adjustment	2.4¢	2¢		3¢	2¢
Bracket					
Number of markets	2[c]	0		3	0
Minimum adjustment	3¢	...		2¢	...
Maximum adjustment	3¢	...		3¢	...
Average adjustment	3¢	...		2.5¢	...
Use accelerator or accumulator					
Number of markets	0	1		3	1
Limits to adjustment[d]					
Number of markets				(e)	(e)
21-30¢	2	1		1	...
31-40¢	2	...		1	...
41-50¢	2[c]	...		3	...

[a] Excludes adjuster prescribed for Louisville-Lexington, which was not yet in effect, and Milwaukee adjuster, which uses the adjustment computed for the Chicago market.

[b] Excludes 3 markets in which adjustment varied from 1¢ to 3¢ per point depending on the operation of an accumulator.

[c] Uses approximate averages for Ft. Wayne, for which rates and limits varied seasonally and in some cases differed for plus and minus adjustments.

[d] Aside from limits imposed to keep prices in line with prices in other markets or to prevent contraseasonal price adjustments.

[e] Excludes Wichita, Southwest Kansas and St. Louis, respectively, which had no specific limits to the supply-demand adjustment.

4. Most commonly prices are adjusted 2 or 3 cents per hundredweight per point of deviation from the standard utilization percentage.

5. Accelerator devices are used with both 12-month adjusters, and accumulators are used with 3 of the 13 2-month adjusters.

6. Limits are specified for 12 of the 15 adjusters.[1] These range from 24 cents to 50 cents. In general, limits are smaller for markets like Chicago and Minneapolis-St. Paul, where Class I prices are relatively low, than in markets where Class I prices are farther above the price of manufacturing milk. In the majority of these markets, limits were less than 10 percent of 1960 average Class I prices.

In November, 1960, 15 independently computed supply-demand adjusters were in use in markets outside the North Central Region. Examination of their characteristics brings out these similarities and differences with adjusters used in the North Central Region:

1. Most outside adjusters use 2-month bases, as is true for adjusters within the North Central Region.

2. A larger proportion of the markets outside the North Central Region than of those within use ratios computed by dividing producer receipts by Class I sales.

3. Since markets outside the North Central Region are more typically in areas of limited supplies, their standard utilization percentages commonly are nearer to 100 than those in North Central markets.

4. Rates of adjustment per point of deviation from normal appear generally to be about the same as those in North Central markets.

5. Limits to adjustments tend to be wider than in North Central markets.

ADJUSTER OPERATIONS IN SIX NORTH CENTRAL MARKETS

For intensive study of the characteristics and behavior of supply-demand adjusters, case studies were made of six of the largest markets in the region: Chicago, Detroit (now Southern Michigan), St. Louis, Cleveland (now Northeastern Ohio), Minneapolis-St. Paul, and Kansas City.[2]

Types of Adjusters

Major features of the adjusters in these markets on November 1, 1960, and a summary of major changes in the adjuster in each market

[1] The St. Louis adjuster has no limits. For Wichita and Southwest Kansas, limits are specified in terms of price relationships to other markets rather than as limits to the adjuster itself.

[2] Initially Milwaukee was included, but because the Chicago adjuster is effective in that market, it was excluded from this discussion.

since it went into effect are given in Table 3. These adjusters exhibit much of the diversity in mechanics shown by all adjusters in the region, and are fairly representative of the larger group as to individual characteristics. Exceptions exist in that the six markets include both markets in the region that use 12-month bases, and three of the five that use accelerators or accumulators.

By late 1960, adjusters had been in operation in these markets for an average of about 8½ years. After adjusters were introduced, some of the provisions for all of them except that for Northeastern Ohio were materially modified. The adjusters for Chicago, Minneapolis-St. Paul (which used the Chicago adjuster for a time), and possibly Kansas City, are the only ones in which there have been widespread changes.

Effect on Price

A study of the behavior of these adjusters (Fig. 5) brings out several conclusions. The adjusters exhibited much greater diversity in behavior than did trends in receipts-Class I sales relationships (page 28). Although there were instances in which similar movements (such as the upward movement in 1955 and the decline in the latter half of 1956) occurred in all six adjusters more or less simultaneously, there were numerous instances in which they moved divergently. There also was considerable variation in degree of fluctuation, with Kansas City at the wide extreme and Chicago at the narrow extreme.

Early in the period of their use most of these adjusters increased prices. Since 1953, however, all adjusters except that for St. Louis more commonly have depressed prices.

Adjusters frequently changed the Class I differential by more than 10 percent, and changes of 20 percent were not uncommon (Fig. 6 top). In the aggregate, in 1958 and 1959 the Chicago adjuster reduced the Class I differential in that market by approximately 25 percent. From mid-1958 to the end of 1959, the Detroit adjuster took away nearly one-third of the Class I differential provided by the order in that market.[1] Commonly Class I differentials vary seasonally from a minimum in the spring period of flush production to a maximum in the period of shortage in late summer and early fall. Consequently the percentage change in the differential attributable to the adjuster may vary seasonally (as in Chicago) even though the adjustment is comparatively uniform from month to month.

[1] In both of these markets the effect of the adjustment was compensated, in part or more, by the payment by handlers of premiums above the minimum Class I prices prescribed by the orders (pages 43-44).

Table 3. — Major Characteristics of Supply-Demand Adjusters in Effect in Six Midwestern Markets as of November 1, 1960

Characteristic	Chicago	Northeastern Ohio[a]	Detroit[b]
Computation of ratio	Class I and II sales divided by producer receipts	Producer receipts divided by Class I sales	Producer receipts divide by Class I sales
Base period	12 months ended 2nd preceding month	1st and 2nd preceding months	1st and 2nd preceding months
Computation of accelerator or accumulator	Adjust ratio by difference from that for 3rd preceding month	None	None
Tolerance zone	None	None	None
Standard utilization percentage	72 (annual basis)	Monthly standards range from 122 to 145, average 129	Monthly standards rang from 124 to 158, averag 137
Price adjustment per point of deviation[a]	2¢ per point	Adjust by brackets at approximately 2¢ per point	3¢ per point
Limit on adjustment	Plus or minus 24¢	Plus or minus 25¢	Plus or minus 45¢
Date first effective	July 1, 1951	July 1, 1953	Nov. 1, 1951
Major changes since adoption (excludes short-term suspensions, temporary limitations, etc.)	For first year used 6-month base with standard percentages and adjustment rates and limits that varied seasonally. Main features of present device effective July 1, 1952. 24¢ limit adopted Mar. 1, 1954. Rate changed from 3¢ to 2¢ per point and accelerator added Aug. 1, 1955.	Few major changes since Aug. 1, 1953, when fully effective. Standard percentages changed three times. Akron and Stark County included since Feb. 1, 1957 and North Central Ohio receipts and sales included since Aug. 1, 1960.	45¢ limit effective Nov. 1955. Bracket adjustments replaced by unifo rate per point Sept. 1, 1956. Standard percen ages changed three time

[a] Cleveland, Akron, Stark County (Canton).
[b] Detroit provisions are those effective through January, 1960. As of February, 1960, the marketing area greatly expanded, and provisions for the adjuster markedly altered. Provisions for revised adjuster not fully effect till March 1, 1961.

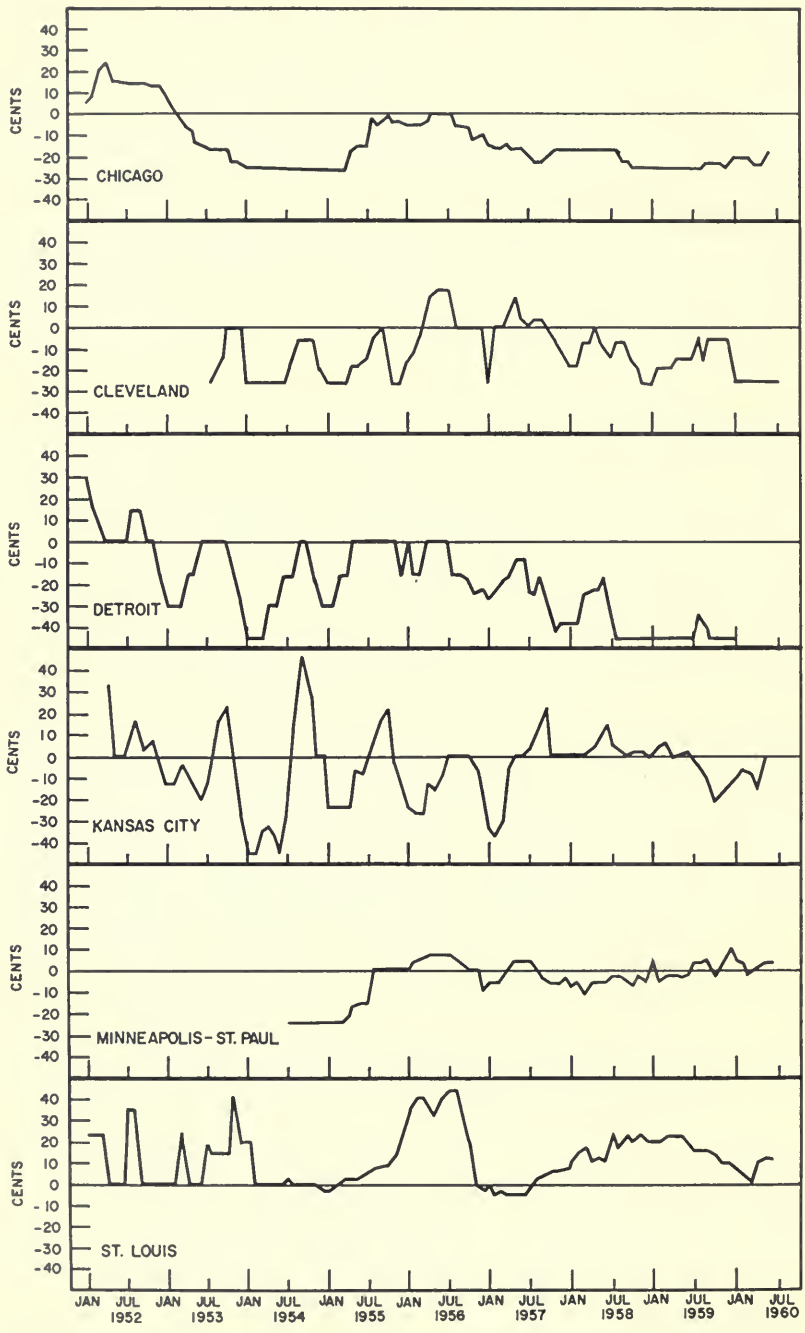
In contrast to their effect on Class I differentials, the greater part of the time any changes these adjusters made in the Class I price were not in excess of 5 percent of that price (Fig. 6 center). They rarely adjusted Class I prices by as much as 10 percent.

Table 3. — Concluded

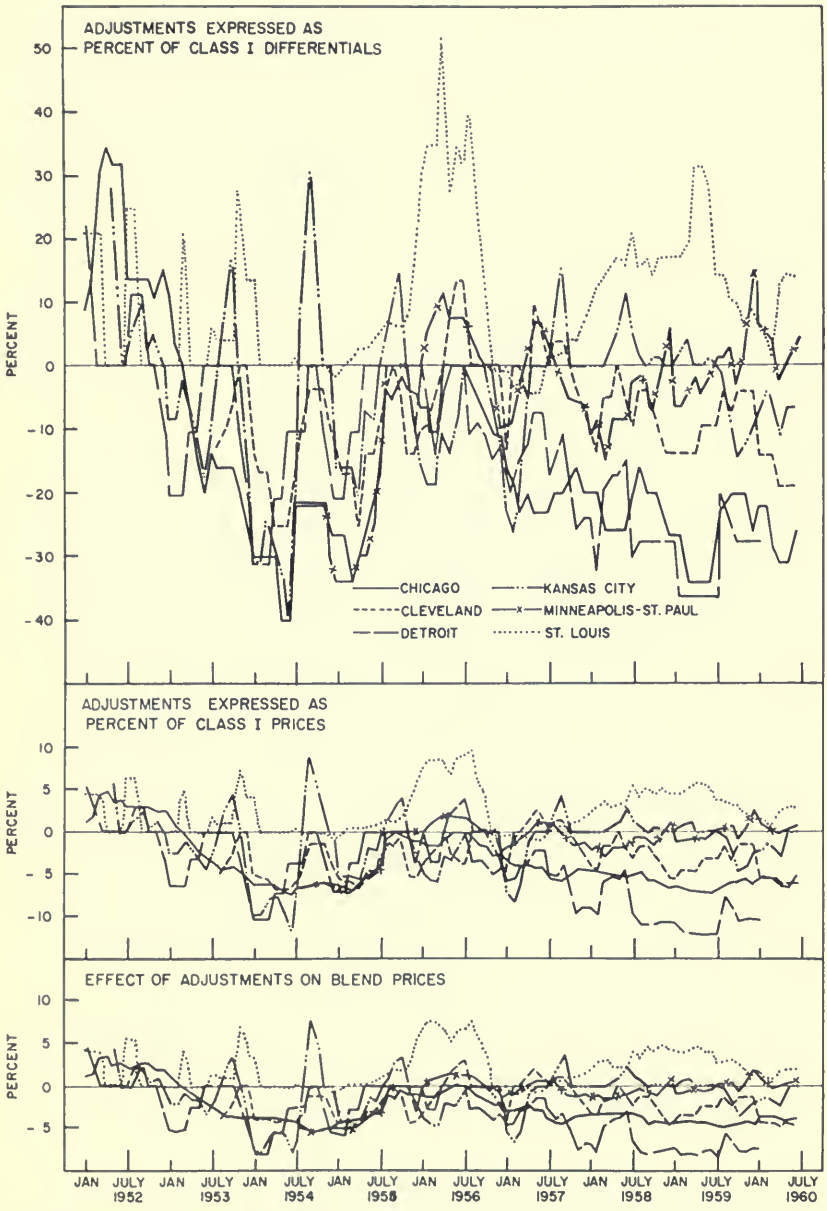
Characteristic	Kansas City	Minneapolis-St. Paul	St. Louis
omputation of tio	Producer receipts divided by Class I sales	Class I sales divided by producer receipts	Producer receipts divided by Class I sales
ase period	2nd and 3rd preceding months	2nd and 3rd preceding months	12 months ended 2nd preceding month
omputation of ccelerator or ac- mulator	1¢ added each point deviation in same direction in current month and in (a) preceding month and also (b) in 2 preceding months	None	Adjust ratio by difference from that for 3rd preceding month
olerance zone	8 points	None	None
tandard utilization ercentage	Monthly standards range from 124 to 151, average 134	Monthly standards range from 66 to 88, average 77	130 (annual basis)
rice adjustment er point of deviation[c]	1¢ per point plus accumulator	1.5¢ per point	2¢ per point
imit on adjustent	Plus or minus 45¢	Plus or minus 24¢	None
ate first effective	May 1, 1952	July 1, 1954	Aug. 1, 1949
lajor changes since doption (excludes ort-term suspens- ons, temporary nitations, etc.)	Until May 1, 1955 used ratio sales to receipts and straight 4¢ per point, with no tolerance zone and no accumulator. Standard percentages changed then and twice since.	Used Chicago adjustment if in excess of 6¢ till Feb. 1, 1956, when own adjuster effective. Standard percentages changed and adjustment rate reduced from 2¢ on Sept. 1, 1957.	When first used adjustment was effective for a period of months. Accelerator added Dec. 1, 1955. Rate of adjustment varied seasonally till April 1, 1960. Standard percentage changed from 115 to 120 to 125 to 130.

[c] Point refers to one percentage point, as from 72 to 73 or from 135 to 134.

Probably of most significance in producer decisions is the effect of adjusters on blend prices. Since supply-demand adjusters influence only the price of that part of the milk going into fluid use, they affect blend prices less than they affect Class I prices. In the six markets in the study, supply-demand adjusters affected blend prices by roughly



Behavior of supply-demand adjusters in six Midwestern markets, 1952-1960. (Fig. 5)



Supply-demand adjustments expressed as percent of Class I differentials and Class I prices, and effect of adjustments on blend prices, six Midwestern markets, 1952-1960. (Fig. 6)

Table 4. — Average Effects of Supply-Demand Adjusters on Class I Prices and Blend Prices in Cents per Hundredweight and in Percentages of the Resulting Prices, Six Midwestern Markets[a]

Market	Years included	Effects of supply-demand adjusters on prices			
		Cents per hundredweight		Percentage of price	
		Class I price	Blend price	Class I price	Blend price
Chicago	1952–1959	16	11	4.3	3.0
Detroit	1952–1959	21	14	4.8	3.6
St. Louis	1952–1959	12	10	3.1	2.3
Cleveland	1954–1959	13	9	2.8	2.2
Kansas City	1953–1959	13	9	2.7	2.1
Minneapolis-St. Paul	1955–1959	6	4	1.6	1.1

[a] Considers total effects without regard to direction.

three-fourths as much, percentagewise, as they affected Class I prices (Table 4). During the period from 1952 through 1959, the adjusters commonly affected blend prices by less than 4 percent (Fig. 6 bottom). In dairy farming, price changes of this extent, even though they may not be large relative to the blend price, can materially affect producers' incomes.

Trends in Ratios of Receipts to Class I Sales

In the six markets, trends in annual average percentages of producer receipts used in fluid milk products have not exhibited a uniform pattern (Fig. 7). St. Louis, after a decline in percentage of receipts used in Class I products from 1952 to 1953, either has maintained the 1953 level since then, or has risen above it in some years. Trends in Kansas City, Cleveland, and Minneapolis-St. Paul have been somewhat similar to that in St. Louis. On the other hand, in Chicago and Detroit, the proportion of milk from producers used in fluid milk products had declined appreciably by 1959.

These trends, particularly the decline in utilization percentages in Chicago and Detroit, raise the question of the influence of supply-demand adjusters in regulating producer receipts. Because a complex of both price and non-price factors affects receipts and Class I sales, it is impossible to tell what relationships between producer receipts and Class I sales might have developed in the absence of adjusters.[1]

[1] Class I price formulas might have been different if supply-demand adjusters had not been employed.

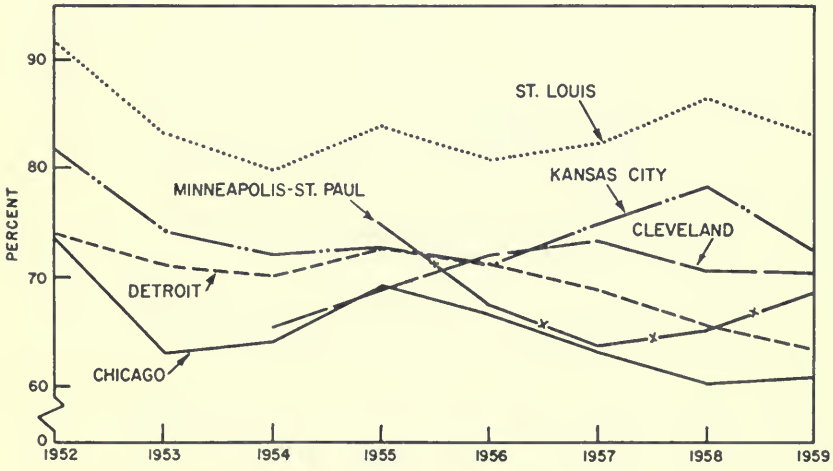
For example, in Chicago and Detroit, price deductions made by adjusters since early 1957 have been largely offset by premiums obtained above federal order prices (pages 43-44). In addition, in these and other markets non-price factors are believed to have expanded milk production in recent years. These include such items as the shift to bulk handling, artificial breeding, improvements in pasture and in other roughages, and the general opportunity to reduce unit costs by expanding output.

Similarly, many conditions influence Class I sales. The extent to which changes in the Class I price that are caused by supply-demand adjusters affect prices paid by consumers for milk is not known. Whatever the effect, a variety of other factors, including some that influence price and others that do not, affect Class I sales. These include marketing margins, level of per capita income, and competition from substitutes for fresh milk and cream.

Problems in Operation

Selection of standard utilization percentages

The standard utilization percentages selected for a market provide the points of departure used in computing supply-demand adjusters. Consequently the decision as to what standard percentages to use may materially affect the behavior of the adjuster. The standard



Class I sales expressed as percent of producer receipts (annual averages), six Midwestern markets, 1952-1959. (In Chicago, the ratio is of Class I and II sales to producer receipts.) (Fig. 7)

utilization percentages employed are commonly based on historical relationships between producer receipts and Class I sales. If the relationship selected for a base is unsuitable or if a substantial change in market conditions occurs, a modification in the standard percentages may be necessary (pages 10-11).

In five of the six markets studied, standard utilization percentages were within a narrow range.[1] To examine the effects of standard percentages over a wider range, this analysis was broadened to include all markets in the North Central Region that had independently computed supply-demand adjusters which were effective before 1954.[2]

Average standard utilization percentages in these markets, expressed as ratios of Class I sales to producer receipts, ranged from 60 to 86. In 7 of the 11 markets percentages were between 71 and 76; for analysis these were treated as one category. The market having a ratio of about 60 was treated as a second category, and the three with ratios in excess of 80 as a third (Table 5).

Throughout the period, supply-demand adjustments were positive (plus) to a considerably greater extent in the two categories with relatively low and high ratios than in the middle category, in which most of the markets were included. Trends in current (actual) utilization ratios did not appear to differ sufficiently to account largely for this difference in the behavior of the adjusters.

The standard ratios in the three markets which exceeded 80, though high as compared to most other markets, were not high relative to their current utilization percentages. These are markets that tended to be short of milk. If they were to increase supplies from producers to levels that would assure self-sufficiency, changes in their standard utilization percentages would be necessary. Meanwhile, in these as in other markets, specifications for supply-demand adjusters must be written to keep Class I prices reasonably well in line with Class I prices in surrounding markets.

The rather general deductions from price by adjusters in the larger group of markets that had standard ratios in the seventies do not establish that those ratios were too high. In several of these markets, proportions of surplus milk appeared to be considerably above levels dictated by market needs.

[1] For this purpose, annual averages of monthly utilization percentages were used. For uniformity, all ratios were expressed as the quotient of Class I sales divided by producer receipts.

[2] In most of these markets standard utilization percentages were changed at least once during the period studied. They were classified accordingly on the basis of the average standard utilization percentage over the period January, 1953-June, 1960, or such portion of that period as an adjuster was in use.

Table 5. — Behavior of Supply-Demand Adjusters and Current Utilization Percentages in Groups of Midwestern Markets Classified by Value of Standard Utilization Percentages, 1954-1955 and 1958-1959

Average standard utilization percentage[a]	Markets in group	Percent of months adjustment was						Average current utilization ratio	
		Plus	Zero	Minus	Plus	Zero	Minus		
		1954–1955			1958–1959			1954–1955	1958–1959
60	Cincinnati	67	12	21	100	0	0	63	70
74 (Range: 71 to 76)	Ft. Wayne, Chicago, Columbus, Cleveland,[b] Detroit, Kansas City, Dayton-Springfield	13	21	66	36	15	49	71	71
84 (Range: 81 to 86)	St. Louis, Toledo, Tri-State	45	40	15	92	7	1	86	87

[a] Average of annual or monthly percentages over period January, 1953-June, 1960, or such portion of the period that an adjuster was in use. For uniformity, all ratios are expressed as the quotient of Class I sales divided by producer receipts.
[b] Northeastern Ohio starting August, 1959.

The problem of intermarket price alignment is related to the choice of a standard utilization percentage, but should not be confused with it. Where supply or sales areas of markets overlap to a large extent, as between a primary market and its secondary markets, prices in those markets need to be carefully aligned. Because supply-demand adjustments are part of the pricing complex, it may be necessary to use, in the secondary markets, supply-demand adjustments that reflect the relation of producer receipts to Class I sales for the entire area, or for the dominant market. For example, the proportion of producer receipts used in fluid milk products is considerably higher in Milwaukee and in Rockford-Freeport than it is in Chicago. Nevertheless prices in these markets reflect Chicago's supply-demand adjustments in order to maintain needed price relationships.

Responsiveness

An adjuster's promptness of response to changing conditions is largely determined by the length of the interval between the base period used and the time at which the adjuster is announced or affects prices. Time is required to assemble and tabulate the data needed to compute the adjustment and to get the information out to producers. Since a lag is inevitable, our concern must be with the extent of the lag and the seriousness of its consequences.

It is essential to distinguish between the timing of the response in price and its extent. A change sufficient to affect an adjuster with a 12-month base will be reflected by that adjuster as promptly as it will show up in a 2-month adjuster if the interval between the time of the change and the time of computing the adjustment is the same for both. The difference between the two types of adjusters is in the extent of the adjustment and in the period of time over which the changed condition affects the adjustment, rather than in the amount of time required for the initial response.

The reasons for this difference in behavior are not difficult to understand. Because the conditions reflected in a given month's statistics are averaged with those of 11 other months rather than one other month, a given change results in a smaller response with the 12-month adjuster than with the 2-month adjuster. On the other hand, because that month's conditions enter into computation of the adjuster for 12 months rather than 2 months, the effect is spread over a longer period.

Since the response with a short-base adjuster is more pronounced and occurs over a shorter period, it appears better suited than a long-

base adjuster to take care of a *significant,* relatively short-term change in conditions. To obtain a sharp response of this type, however, requires use of an adjuster that responds excessively to many changes in receipts-Class I sales ratios that are too short-lived to be of consequence.

Although the response with a 2-month base is more pronounced and not spread over as long a period as that of a 12-month base, the shorter base will not necessarily assure effective timing of price adjustments. For example, at the time of a serious drouth in July, 1954, the Kansas City adjuster was deducting because producer receipts had been relatively ample in May and June. By September and October, when the adjuster added substantially to price in response to the drouth, receipts were back to their usual relationship to sales of Class I milk.

The timeliness of adjustments also involves when they are announced. Adjustments computed from a base that ends the month preceding the pricing month commonly are not announced in advance but are reported as one of the elements determining price when it is issued. Thus producers and handlers do not have advance notice of the amount and direction of the adjustment. Adjustments computed from bases that end the second month preceding the pricing month may be announced the month before they are effective. In markets using "manufacturing plus" formulas for pricing fluid milk, this provides both producers and handlers opportunity to base their plans on knowledge or a close estimate of the Class I price in the following month.

Stability

Since adjusters are designed to respond to changes in the relationship of Class I sales to producer receipts, stability should be judged in relation to changes in this ratio. Characteristically the ratio changes seasonally, with producer receipts above average relative to Class I sales in late spring, and below average in late summer and early fall. To eliminate the effect of this seasonal pattern, individual monthly ratios are expressed as differences from the respective averages of the ratios for each of those months. Variation in the ratio is then measured in terms of the change from month to month in these differences. The relative amount of change from month to month in the supply-demand adjustment, expressed as a percentage of the Class I differential for that market, is compared with these changes in the receipts-Class I sales ratio.

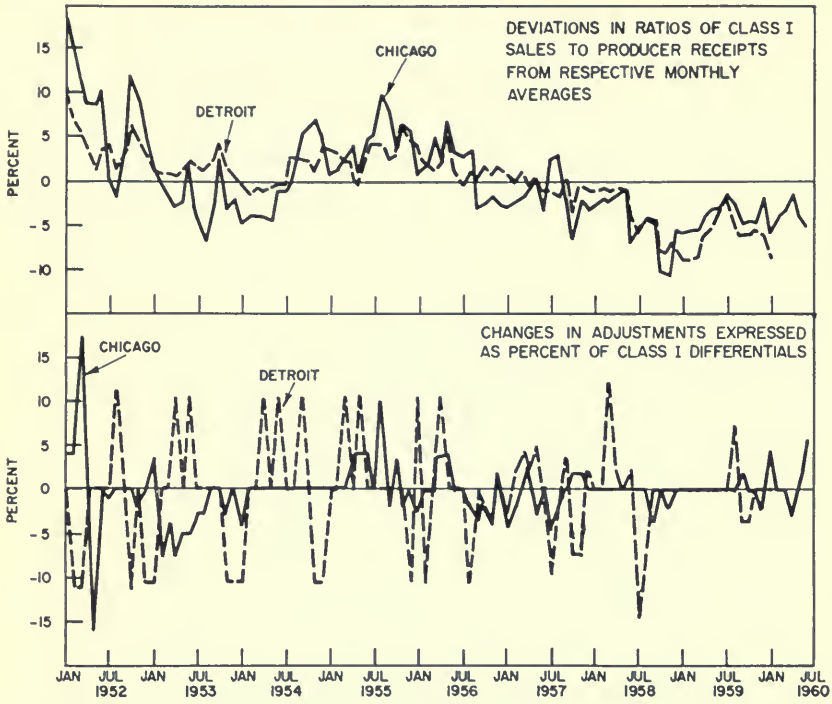
Relative amounts of fluctuation in the Chicago and Detroit adjusters are compared in this manner in Figure 8. The two curves on the top portion of the chart indicate there was somewhat less variation in the relationship of Class I sales to producer receipts in Detroit than in Chicago. The curves on the bottom portion indicate that the adjuster fluctuated much more widely in Detroit than in Chicago.

Average month-to-month changes in the two ratios in each of the six markets are similarly compared in Table 6. In these terms, the ratio of Class I sales to producer receipts was most variable in St. Louis and least variable in Detroit.[1]

Supply-demand adjustments were least variable in Chicago and most variable in Kansas City. The St. Louis adjustment, which uses a 12-month base, fluctuated nearly as much in relation to the Class I differential as the Cleveland adjustment. Fluctuations in the St. Louis adjustment were intensified by the seasonal changes in its rate, which prevailed over most of the period. Even with these seasonal changes, however, fluctuations in the St. Louis adjustment were much smaller in relation to changes in the ratio of Class I sales to producer receipts than were those in the four markets using 2-month adjusters.

Adjusters using 12-month bases are stable because they are little affected by short-term fluctuations in the relationship between producer receipts and Class I sales. Some of the short-term changes in that relationship logically should not affect the supply-demand adjuster. For example, Baumer and Kepner have demonstrated that, with an adjuster using a 2-month base, the relationship obtained depends in part on the comparative numbers of early-in-the-week days and late-in-the-week days that happen to fall in the 2-month period. They suggest an adjustment that may be used to correct this effect, which is attributable to the wide day-of-the-week fluctuations in sales of pack-

[1] Products in which milk usage is considered in computing the receipts-Class I sales ratio, although usually termed "Class I sales" in this report, varied appreciably among markets. For example, in Detroit they excluded bottled cream. At the other extreme, in Chicago they included ice cream and, quite likely, proportionally larger sales of bulk milk and cream to unregulated plants than in other markets. These differences helped to account for the differences in amount of variation in the ratio of Class I sales to producer receipts. For example, in Chicago, with ice cream and bulk sales of milk and cream to unregulated plants excluded from the ratio, the average change from month to month was reduced from 1.8 to 1.4 points. Because of these differences, these data should not be used as indication of the comparative effectiveness with which producer receipts had been adjusted to dealers' needs in the various markets. On the other hand, changes in the ratio, as the ratio is computed for each market, provide the logical base for measuring fluctuations in the supply-demand adjustment.



Comparison of deviations in ratios of Class I sales to producer receipts from respective monthly averages and changes in adjustments expressed as percent of Class I differentials, Chicago and Detroit, 1952-1960. (Fig. 8)

aged milk products by handlers.[1] There is no similar problem for a 12-month base period because numbers of early-in-the-week and late-in-the-week days balance out over a period of that length.

There are numerous other examples of fluctuations to which 2-month bases are more sensitive than 12-month bases. They include fluctuations that reflect shifts in seasonal patterns of producer receipts (pages 36-40), those caused by weather that is unusually favorable or unfavorable for milk production, heavy short-term sales of fluid milk in bulk for Class I use in other markets, and those associated with the obtainment or loss of contracts with large outside military establishments by bottlers in the marketing area.

[1] Baumer, E. F., and Kepner, K. W., The Effect of Intra-Week Fluid Milk Sales Fluctuations on Supply-Demand Adjustments, Dept. Agr. Econ., Ohio State Univ., mimeographed, September, 1960, 7 pages.

Table 6. — Comparison of Variation in Ratios of Class I Sales to Producer Receipts and in Supply-Demand Adjustments

Market	Period included	Average change from month to month in ratio of Class I sales to producer receipts[a]	Month-to-month changes in supply-demand adjustments in percent of Class I differential
		percentage points	*percent*
Chicago	Jan., 1954–June, 1960	1.8	1.3
Detroit	Jan., 1954–Jan., 1960	1.3	3.3
St. Louis	Jan., 1954–June, 1960	2.8	2.7
Cleveland[b]	Jan., 1954–June, 1960	1.6	2.9
Minneapolis-St. Paul	Feb., 1956–June, 1960	1.6	3.3
Kansas City	Jan., 1954–June, 1960	2.2	5.2

[a] To eliminate seasonal fluctuations in this ratio, the changes measured were those in deviation of monthly ratios from their respective monthly averages.
[b] Northeastern Ohio since August, 1959.

Contraseasonal behavior[1]

Supply-demand adjusters are not intended to serve as pricing devices that bring the seasonal pattern of production more closely in line with the seasonal pattern of fluid milk sales. Nevertheless an adjuster should be so designed that it does not inhibit needed seasonal changes in production patterns.

An adjuster that uses a 12-month base largely avoids seasonality problems because the relationship of milk supplies to fluid milk sales in all months of the year enters into the computation. But seasonality problems may exist with adjusters that employ bases of less than one year.

With such adjusters, the USDA attempts to eliminate the seasonality factor by using monthly standard utilization percentages that reflect the seasonal pattern of production in the market. With this arrangement, the seasonality problem arises when producers change their seasonal pattern of production. In a market with an adjuster that employs a 2-month base, an increase in fall production and a decrease in late spring production may reduce prices in the late fall

[1] For this study, contraseasonal behavior refers to either, or the combination of, (1) price increases from the operation of the adjuster during or just preceding the season of flush production, or (2) price decreases during or just preceding the season of slack production. A year-round or other persistent reduction in price was not considered to be contraseasonal in the fall, nor was a similarly persistent increase considered to be contraseasonal in the spring.

and increase prices in the early summer. Such an effect on prices is objectionable unless the seasonal adjustment in production has been sufficient to make producer receipts more ample relative to Class I sales in the fall than they are in the late spring.

As basis for judgment on seasonal pricing effects of adjusters, average adjustments in April-June are compared with those in the immediately following September-November and December-February periods. In 1955-1956, the aggregate adjustment for all Midwestern markets using adjusters reduced prices in the spring period relative to the effect in the succeeding fall and winter periods.[1] On the other hand, in the next three seasons the average adjustment for September-November involved either adding a little less or subtracting a little more from price than the average for April-June. In these three seasons, average supply-demand adjustments in December-February lowered prices by about 8 cents per hundredweight as compared with their effect the preceding spring. This occurred even though Class I sales continued to be larger relative to producer receipts in the fall and winter than in the spring and early summer. By the 1959-1960 season, however, these contraseasonal effects had been eliminated and adjustments were about the same in the three periods of the year.

Analysis of adjustments in the four intensively studied markets that employed 2-month bases led to generally similar conclusions. Average adjustments in these markets in September-November were 10 cents or more higher than those in the preceding April-June as commonly as they were 10 cents or more below them (Table 7). But in half of the 24 "market years" analyzed, adjustments in December-February averaged 10 cents or more per hundredweight below those in the previous April-June. Contraseasonal adjustments of this magnitude were most apparent in Detroit and least apparent in Minneapolis-St. Paul.

These contraseasonal effects reflected tendencies to level supplies by increasing milk production in the fall, particularly in November and December, relative to production in the spring. In appraising these developments, note that supply-demand adjustments in three of the markets were based on relationships in the first and second preceding months.[2] In these markets a change in the adjustment lagged by one to two months after any change it reflected in seasonality. In Minneapolis-St. Paul, which based the adjustment on relationships in the second and third preceding months, the lag was one month greater.

[1] The change is computed algebraically. Thus an adjustment of minus 10 cents is 15 cents below an adjustment of plus 5 cents.

[2] In Kansas City, the period used was changed from the first and second preceding months to the second and third preceding months early in 1960.

Table 7. — Seasonal Differences in Supply-Demand Adjustments in Four Markets With Adjusters Employing 2-Month Bases

Market	Seasons compared[a]	Seasons in which adjustments differed by 10 cents or more from preceding April–June			
		September–November		December–February	
		Higher	Lower	Higher	Lower
		number			
Cleveland[b]	6	2	1	...	3
Detroit	7	1	3	...	5
Kansas City	7	3	1	1	3
Minneapolis-St. Paul	4	...	...	...	1

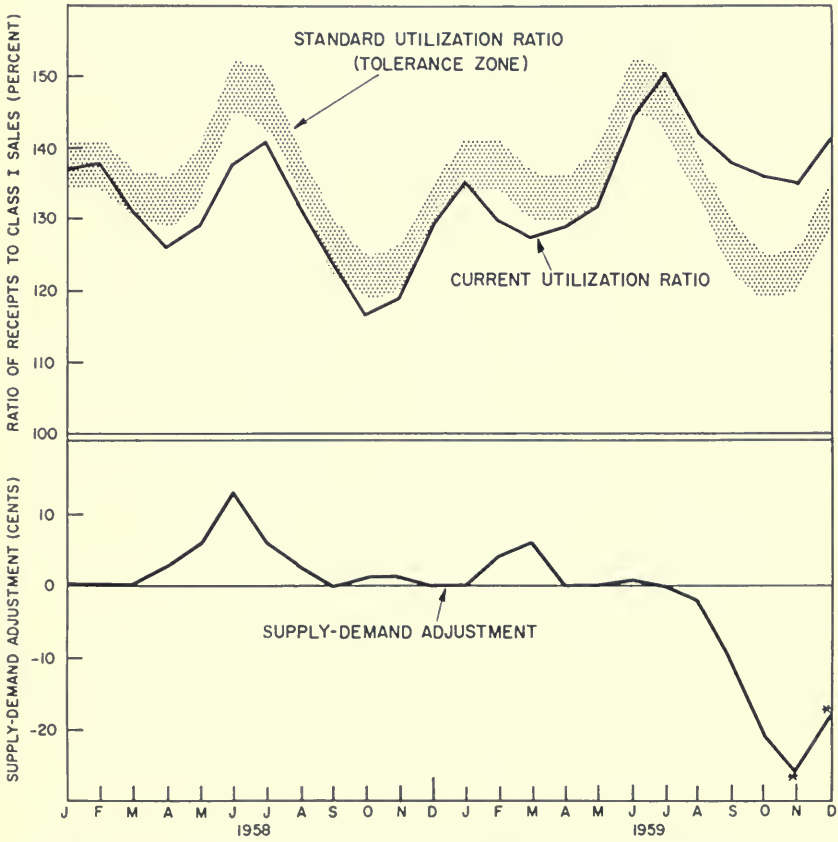
[a] This was a series of seasons ending in 1959-1960 for all markets except Detroit. For Detroit the series ended with 1958-1959 because of drastic changes with introduction of the Southern Michigan order on February 1, 1960.
[b] Northeastern Ohio since August, 1959.

Data for Kansas City for 1958-1959 may be used to show how contraseasonal adjustments are generated. During all of 1958 and the first half of 1959, the ratio of receipts to Class I sales (this refers to the "current utilization ratio" computed in determining the supply-demand adjustment) closely followed the lower limits of the tolerance zone prescribed by the standard utilization ratios (Fig. 9). This resulted in supply-demand adjustments that mostly were in the range from 0 to plus 6 cents. But starting in mid-1959, receipts rose above their standard relationship to Class I sales, and pushed the current ratio above the upper limits of the tolerance zone, particularly in the September-November period. Disregarding suspensions in November and December, this resulted in minus adjustments ranging from 10 to 26 cents per hundredweight in the last four months of the year. These deductions were dictated by utilization ratios that reflected fuller use of receipts in Class I products than ratios for June-August that yielded supply-demand adjustments of approximately zero.

The USDA has attempted to cope with the problem of contraseasonal adjustments in two ways. In markets using set standard utilization ratios, these have been updated from time to time to reflect the changing seasonal pattern of production. For example, the standard utilization ratios for Kansas City effective on May 1, 1952, were revised May 1, 1955, October 1, 1957 (when the marketing area was expanded to include Topeka), and February 1, 1960. The Detroit utilization schedule adopted November 1, 1951, was modified November 1, 1952, November 1, 1955, and September 1, 1956, the latter continuing in effect until February 1, 1960, when the Detroit order was superseded

by the Southern Michigan order. The contraseasonal adjustments that occurred despite these revisions suggests that this action, though alleviating the problem, did not solve it.

Another attempt by the USDA has involved computing monthly utilization ratios based on the seasonality patterns that prevailed in the two or three years immediately preceding. This complicated method has long been used in computing the supply-demand adjuster for New York, and was incorporated in provisions for the Southern Michigan order. While this method involves a more systematic updating of the



* Amount shown is full amount that would have been deducted if there had not been the suspensions of minus 8c and minus 6c in November and December.

Standard and current utilization ratios and supply-demand adjustments, Kansas City, 1958-1959. (Fig. 9)

seasonality pattern of standard utilization percentages than has been accomplished through hearings, it will not eliminate contraseasonal adjustments with as pronounced a shift in season of production as that in Kansas City between 1958 and 1959.[1]

Not all responses of short-base adjusters to shifts in seasonality patterns have been objectionable. In some cases a lower production peak in May and June has caused adjusters to raise prices (relatively if not absolutely) in the late summer, which is becoming a period of tight milk supplies in some markets.

On the other hand, the full disadvantage of using established monthly standard utilization percentages does not show up in contraseasonal adjustments. Other deviations in the seasonal pattern of the receipts-Class I sales relationship from that established in a fixed schedule of monthly standard utilization percentages may become evident in still other types of fluctuations in the adjustment. In other words, the unstable behavior of adjusters that use bases of less than a year is due in part to the inadequacies of the schedules of monthly utilization percentages used.[2]

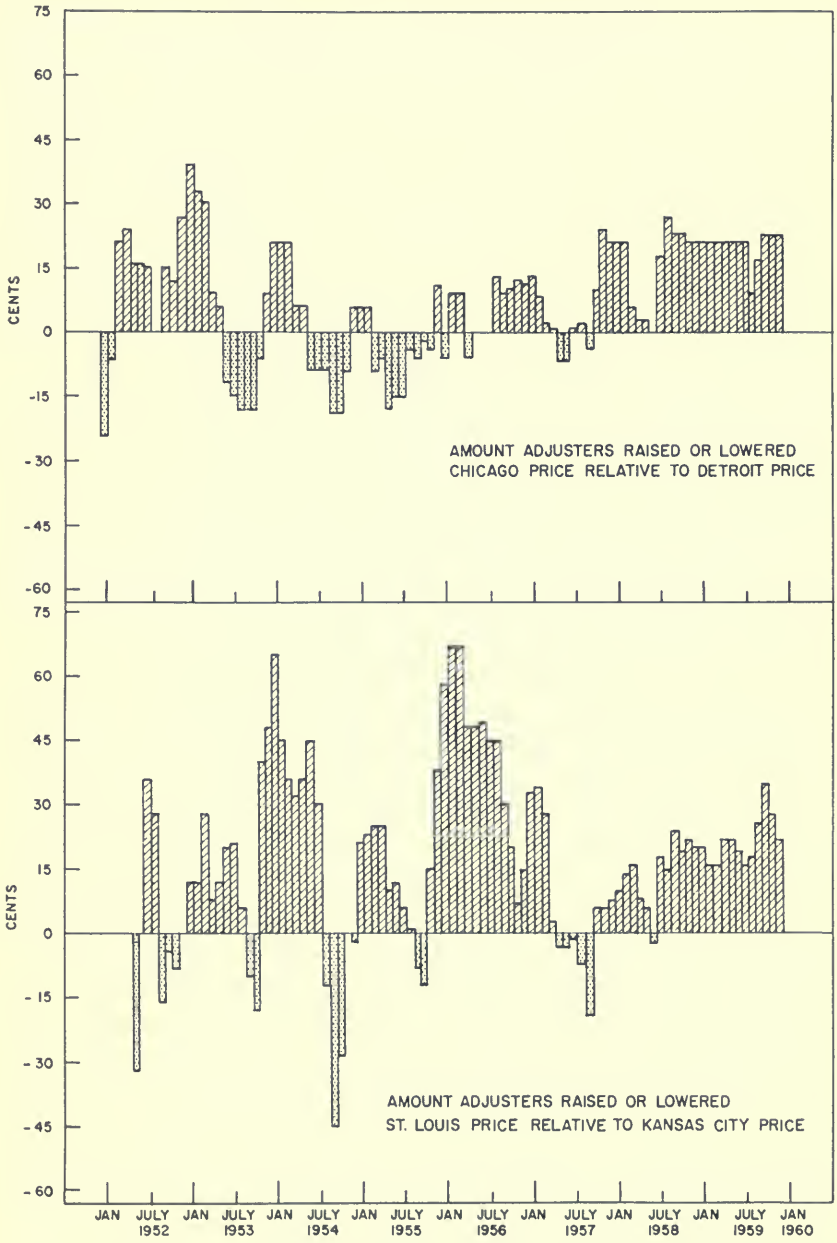
Intermarket price maladjustments

Unlike behavior by adjusters in different markets can affect the relationships between Class I prices in those markets. To illustrate, results of an analysis of the effects of supply-demand adjusters on differences in Class I prices between two pairs of markets are shown in Figure 10. Since both markets of each pair used supply-demand adjusters, the graph shows the combined effect of the two adjusters on the difference in Class I prices between the two markets.

Intermarket differences in Class I prices fluctuated considerably from month to month even when not affected by supply-demand adjustments. Consequently monthly differences in Class I prices between a pair of markets were expressed as deviations from the average intermarket price differences for the same months. To determine to what extent, if any, supply-demand adjustments added to these deviations, this computation was done separately for differences in actual Class I prices (which reflect the effects of the two supply-demand adjust-

[1] Another technique for computing moving indexes of seasonality is described by Julius Shiskin in "Seasonal Computations on Univac," *The American Statistician,* February, 1955, pages 19-24, and by Julius Shiskin and Harry Eisenpress in "Seasonal Adjustments by Electronic Computer Methods," *Journal of American Statistical Association* 52:80, December, 1957, pages 415-449.

[2] Johnson, Stewart, "An Economic Appraisal of Supply-Demand Considerations in Determining Class I Milk Prices Under Federal Orders," in *Papers Presented at 1958 Annual Conference of Federal Milk Market Administrators,* Market Administrator, New York-New Jersey Milk Marketing Area, New York, N.Y., page 32.



Effect of supply-demand adjusters on the relation between Chicago and Detroit Class I prices and on the relation between St. Louis and Kansas City Class I prices, 1952-1959. (Fig. 10)

Table 8. — Comparisons of Deviations From Monthly Averages of Actual Differences in Class I Prices With Deviations There Would Have Been If There Had Been No Supply-Demand Adjustments, 6 Pairs of Markets

Markets	Years included	Average deviations from monthly averages of intermarket Class I price differences that —	
		Included effect of supply-demand adjustments	Excluded effect of supply-demand adjustments
		cents	
Chicago–Detroit	1952–1959	14	11
Chicago–St. Louis[a]	1952–1959	14	14
Chicago–Cleveland	1954–1959	11	6
Chicago–Minneapolis-St. Paul	1956–1959	9	5
St. Louis–Kansas City	1953–1959	18	6
Cleveland–Detroit	1954–1959	17	12

[a] The seeming lack of effect of supply-demand adjusters on fluctuations in intermarket price relationships between Chicago and St. Louis apparently was attributable to the temporary provision of a high Class I price differential in St. Louis in six months of late 1952 and early 1953. This action suspended the effect of supply-demand adjusters in that market for that period. Between this pair of markets over the period 1954-1959, the corresponding average deviation that included the effect of the adjuster was 11 cents, while that which excluded the effect of the adjuster was 5 cents. This latter difference, like the others shown in the table, was statistically significant at above the 95 percent level.

ments), and for the differences there would have been in Class I prices if there had not been a supply-demand adjustment in either market. The averages of the deviations for each of the two series of price differences are shown in Table 8 for each of six pairs of markets.

In the majority of the price comparisons made, supply-demand adjustments increased the amount of fluctuation in intermarket price differences to some extent. The amount of the increase was most pronounced between St. Louis and Kansas City, where it showed the effects of a combination of highly fluctuating adjustments in Kansas City and moderately variable adjustments in St. Louis.

Supply-demand adjusters may affect the size of intermarket price differences as well as the stability of those differences. In the Chicago-Detroit comparison, until late in the period, adjusters had no persistent tendency either to raise or to lower the price in one market relative to that in the other. On the other hand, in most of the months in which adjusters affected the St. Louis-Kansas City differential, they raised the price in St. Louis relative to that in Kansas City. The generally positive values of the St. Louis adjustment over this period raised the St. Louis Class I price relative to the Class I price in Kansas City.

To the extent that price influences their decisions, plant managers

probably make decisions to shift milk supplies between markets on the basis of price relationships which they expect to continue. Therefore effects of adjusters in rather persistently increasing or reducing price differentials between a pair of markets are those most likely to bring shifts in milk supplies between the two markets. Evidence from this study, however, did not indicate that supply-demand adjusters contributed greatly to many such shifts in the six markets over the periods studied.

For a few years in the mid-1950's, plants in northwestern Wisconsin could obtain blend prices that were about 30 cents per hundredweight higher on the Minneapolis-St. Paul market than on the Chicago market. For a period of about a year in late 1953 and early 1954, the difference in supply-demand adjustments contributed 10 to 15 cents to this differential. The differential, which increased sharply to this level early in 1953, over the next few years induced two plants to shift their supplies, and a third to shift part of its supplies, to the Twin Cities market. For about a year early in the period, the difference in supply-demand adjustments was responsible for some one-third to one-half of this differential, thereby apparently contributing to the shift in supplies.

Comparatively large negative supply-demand adjustments in Chicago over much of the three-year period, 1954-1956, also influenced other plants in northwestern Wisconsin to leave the Chicago market at about that time, but those plants did not shift to other federal order markets (page 15). Some other plants also joined, or left, one or another of the six markets during the years included in the study. Nevertheless these were the only cases noted in which supply-demand adjustments clearly contributed to the change.

Super-pool premiums

In recent years producer organizations in a number of Midwestern markets have been obtaining premiums above federal order prices for milk going into fluid use. In some cases these premiums have been obtained continuously, in others, only part of the time. Among the six markets intensively studied, these premiums have been obtained continuously in Detroit since early 1956, and almost continuously in Chicago since early 1957 (Fig. 11). On the other hand, in the period studied there were no premiums of consequence in St. Louis. In Kansas City, in that period, ending in June, 1960, premiums were obtained in the spring of 1959 and 1960 as a device to level the Class I differential throughout the year.

Premiums affected Class I prices appreciably in three of the six markets. In Detroit, from April, 1956 through January, 1960, pre-

miums received on Class I milk averaged more than 50 cents per hundredweight.[1] In Chicago, premiums became effective later than in Detroit, and averaged not quite half as large. In Cleveland, premiums were more nearly the size of those in Detroit, but were obtained only intermittently.

In Detroit, Chicago, and Cleveland, almost without exception supply-demand adjusters deducted from Class I prices in the months premiums were received. In Chicago, until early 1960, premiums almost exactly offset the amounts deducted by the adjuster, whereas in Detroit and Cleveland, they generally exceeded supply-demand adjustments.

These data indicate an appreciable use of super-pool premiums by producer groups to counterbalance the effects of negative supply-demand adjustments. To the extent that they have offset such adjustments, these premiums also have offset any effect those negative adjustments might have in reducing milk supplies on the affected markets. Similarly, premiums obtained in addition to positive supply-demand adjustments could be expected to intensify any influence positive adjustments might have in increasing milk supplies on a market.

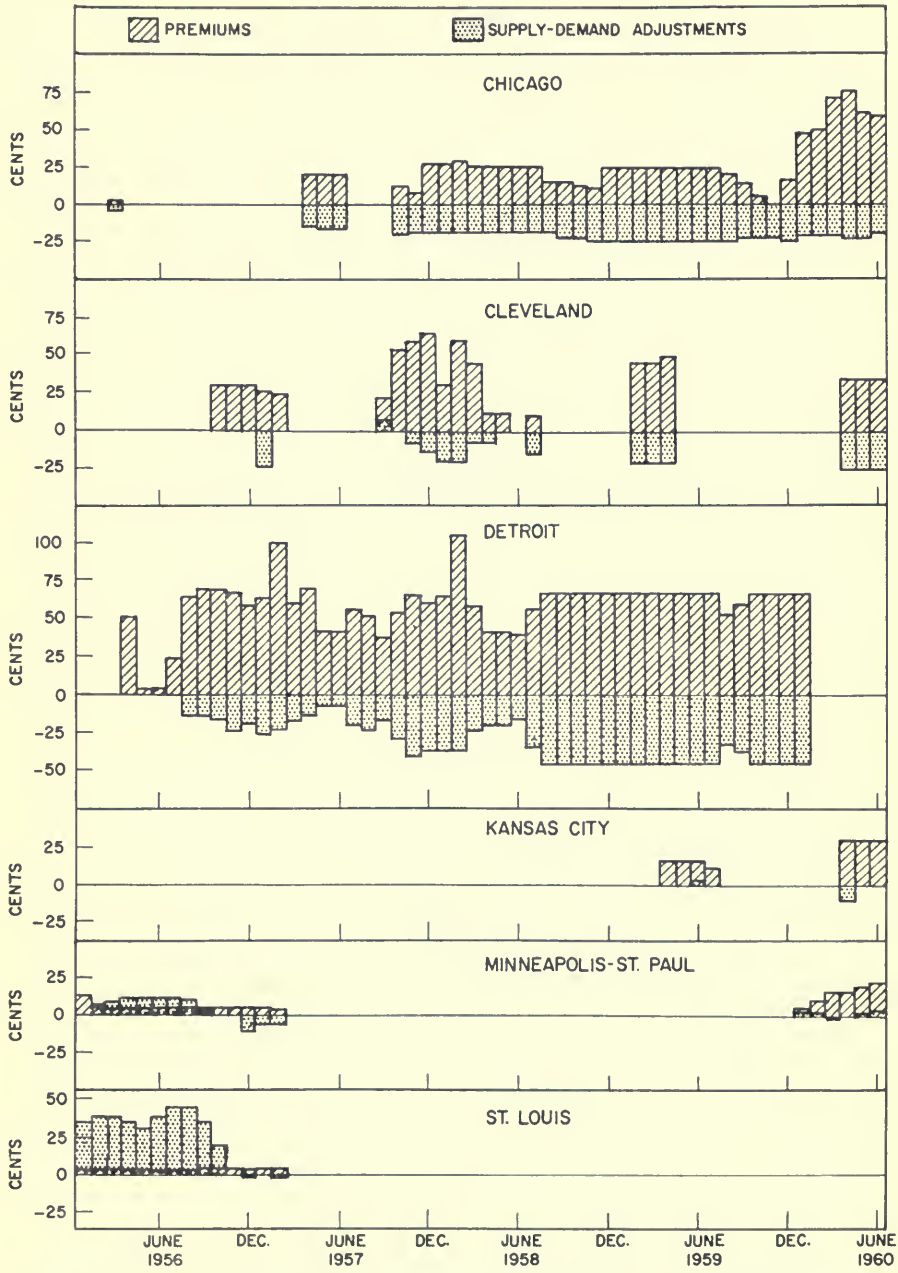
Other adjustments that may be made

It has been demonstrated that the effect of negative supply-demand adjustments may be cancelled by negotiating super-pool premiums. Producer organizations also may request suspensions of all or part of heavy deductions by supply-demand adjusters. To determine the extent to which this has been done, an analysis was made of suspensions in the six markets during the period January 1, 1952, through June 30, 1960, or that portion of the period when an adjuster was used.

In total, adjusters in the six markets were suspended 17 months during this period; this amounted to three percent of the time.[2] Suspension ranged from 8 months in Kansas City to none in Detroit and St. Louis. They ranged in amount from 1 cent to 28 cents, and averaged 11 cents. All were minus. In 7 of the 17 months, all in Kansas City, only a portion of the adjustment prescribed was suspended. Approximately half of the 17 months' suspensions occurred in the fall. In some cases suspensions were clearly obtained to avoid

[1] Data for Detroit terminated with January, 1960, because of drastic change in marketing area and in supply-demand adjustments effective February 1, 1960.

[2] Temporary limits placed on the amount of supply-demand adjustments prior to specification of such limits in an order were not considered suspensions. Likewise, the disregarding of positive supply-demand adjustments in setting Class I prices temporarily at higher levels than order provisions, including those adjustments would have yielded, was not considered as a suspension of the adjuster.



Comparison of super-pool premiums with supply-demand adjustments, six North Central markets, January, 1956-June, 1960. (Fig. 11)

contraseasonal price adjustments, and in others it may have been a consideration. These findings indicate that suspensions provided comparatively little relief from the effects of negative supply-demand adjustments.

The operation of a supply-demand adjuster may also be modified when a cooperative or handler directly influences supplies or consumption of milk for that organization's benefit. For example, in one of the markets studied, producer associations were holding off the market part of the milk received from regular producers. Thus they obtained more favorable supply-demand adjustments and cut down the amount of surplus milk that was reducing the blend price. As part of the arrangement, returns from all milk were pooled and divided equitably among all producers. Under conditions existing in that market, these organizations were able to increase returns to producers by that action.

Though no cases were specifically noted in this study, a handler operating a number of plants might attempt to hold down supply-demand adjustments by shifting milk from sources not regularly attached to a market into that market in critical periods. Similarly, a dominant handler in a market might influence a supply-demand adjuster by drastically changing the level of his sales promotion. Conditions seem likely to be most conducive to these actions in comparatively small markets using adjusters with 2-month bases, in which the amount of the adjustment may be materially affected.

Relation of Mechanics to Performance in a Specific Situation

Performance of an adjuster may be tested by comparing its movements with those of others in a changing market situation. The performance of six types of adjusters was thus tested, using data from the Kansas City market for 1951 through 1955. During those years, that market's ratio of producer receipts to fluid milk sales fluctuated widely.

After May, 1952, when an adjuster became effective in Kansas City, it may have modified the relation of producer receipts to Class I sales in some measure. The operation of that adjuster, to the extent that it had such influence, may have affected the behavior of the other adjusters. It is believed, however, that this type of effect did not contribute greatly to the differences in behavior among the several adjusters tested.

To the fullest extent possible, standard utilization percentages and rates of adjustment were made comparable for all types of adjusters. All ratios were computed as the quotients of Class I sales divided by

producer receipts. Tolerance zones, suspensions, and limits to adjustments were disregarded. As thus modified, the types of adjusters tested were:

1. The Kansas City adjuster in effect May, 1952, through April, 1955. This featured a 2-month base and adjustments at 4 cents per point of deviation.

2. A modification of the Kansas City adjuster that was effective from May, 1955, through September, 1957. This used a 2-month base, and adjustments accumulated on the basis of deviations as computed for the current and two preceding months at 1⅓ cents per point.

3. A modification of the adjuster used in the New York-New Jersey market in which standard utilization percentages are based on the average seasonal pattern of sales in the most recent three years. The first type tested, like the New York adjustment, involved a 2-month base. Adjustments were at 4 cents per point rather than being related to the Class I price, as in New York.

4. A similar modification of the New York-New Jersey adjuster that used a 4-month base.

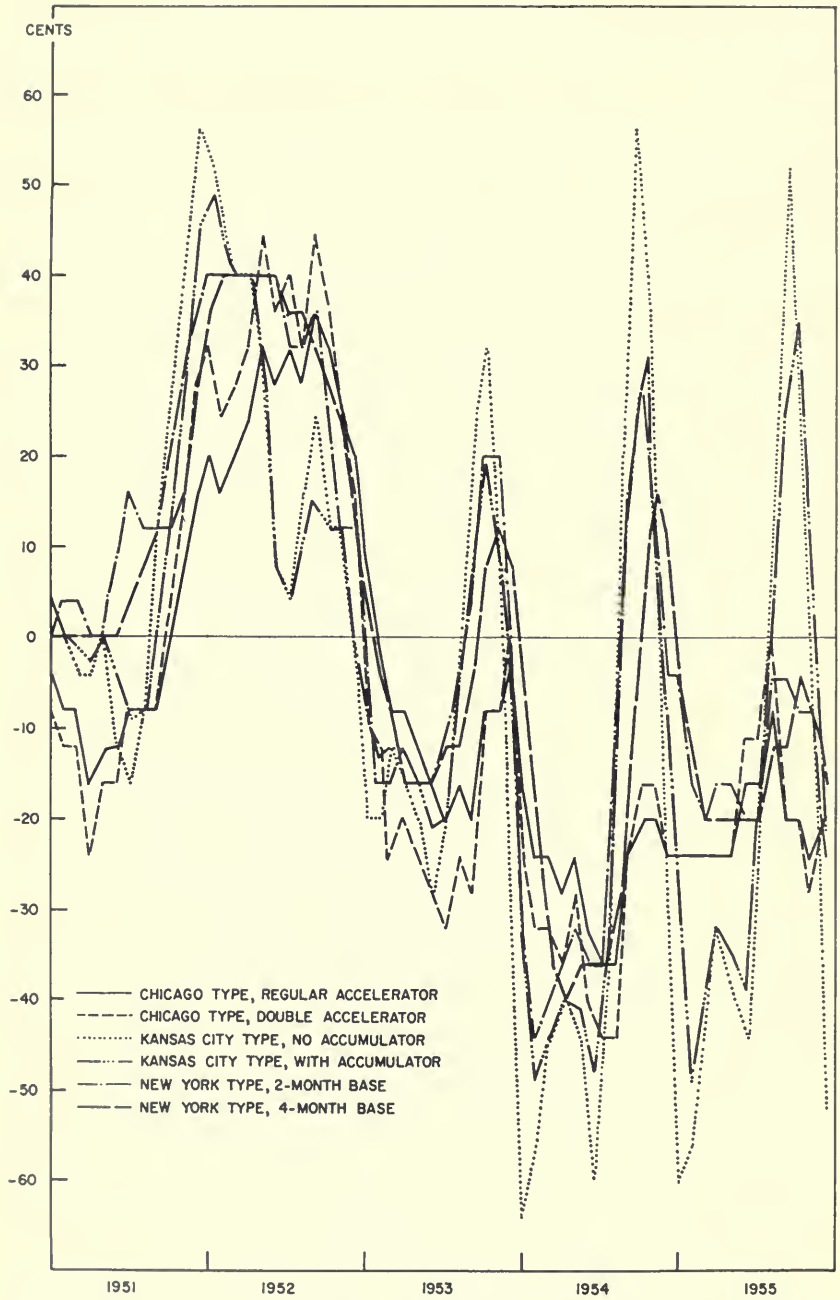
5. An adjuster of the type used in Chicago with a 12-month base and accelerator.

6. Another Chicago-type adjuster in which the effect of the accelerator was doubled.

In 1951 and 1952, the major fluctuations in all adjusters consisted of a sharp rise and subsequent decline in response to the flood-caused shortage of milk in the Kansas City area in late 1951 (Fig. 12). There was considerable uniformity among adjusters in this response. In the following three years, however, the adjusters varied widely in behavior, with Kansas City types exhibiting the most variability.

The average month-to-month change in the adjustment was more than three times as large for the Kansas City adjuster, used without the accumulating feature, as for the adjuster with the 12-month base and regular accelerator (Table 9). There were corresponding differences in the proportions of large and small adjustments. Both New York-type adjusters were much more stable than the Kansas City types, particularly in 1955. Substantial changes in seasonality occurred by the later years of the period. Thus the New York-type adjuster, which employed moving indexes of seasonality, eliminated the extremes of the fluctuations exhibited by both Kansas City types.

With each of the three basic types of adjusters, the modification that was tested affected its behavior. With the Kansas City type, the



Behavior of six types of adjusters under Kansas City conditions, 1951-1955. (Fig. 12)

Table 9. — Average Month-to-Month Change and Proportion of Changes of Various Amounts, Six Types of Supply-Demand Adjusters, Kansas City Conditions, 1951 Through 1955

	Kansas City adjuster		New York-type adjuster		Chicago-type adjuster	
	No accumulator	With accumulator	2-month base	4-month base	Regular accelerator	Double accelerator
	Average change, cents					
	15.3	10.3	6.8	5.1	4.1	6.3
	Percent of changes					
16¢ or more....	41	27	20	8	0	5
6–15¢.....	27	31	20	27	27	46
0–5¢.....	32	42	60	65	73	49
Total.....	100	100	100	100	100	100

accumulating feature reduced the extremity of its fluctuations, but did not add materially to its stability. Increasing the base period for the New York-type adjuster reduced the amount of fluctuation. Doubling the effect of the accelerator used with the Chicago-type adjuster made it so highly sensitive to changing trends that the undesirable fluctuations it introduced more than cancelled any benefits. Consequently this modification was eliminated from further consideration.

Further tests demonstrated that, with all types of adjusters, variability could be further reduced by introducing tolerance zones into the specifications. But use of tolerance zones did not materially change the character of the response in other respects. A tolerance zone will reduce fluctuations in a highly sensitive adjuster, but the adjustments that remain, though reduced in extent, will be relatively sharp and transitory.

Under these conditions, there were noticeable differences in the performance of the adjusters. The adjuster with a 2-month base originally used in Kansas City was highly capricious. An accumulator, of the type introduced in that market in 1955, somewhat reduced fluctuations, but did not eliminate the basic instability of the adjuster that used simply a 2-month base. The New York-type adjuster, by using moving indexes of seasonality, reduced fluctuations associated with changes in seasonality patterns, and so provided a larger measure of stability. However, the adjuster with a 12-month base and a regular accelerator, as used in Chicago, was still more stable and yet appeared to be sufficiently responsive to significant changes in the receipts-Class I sales ratio to perform effectively.

CONCLUSIONS: CRITERIA FOR EFFECTIVE SUPPLY-DEMAND ADJUSTERS

From this analysis, tentative criteria as to effective mechanics for supply-demand adjusters have been developed. These criteria are concerned with qualities that should be sought in devising the mechanics of an adjuster.

In attempting to attain the declared objective of the USDA, an adjuster should attempt to provide an acceptable over-all balance between producer receipts and Class I sales. Accomplishing this depends partly on selection of suitable standard utilization percentages. Although standards should not be changed casually, they may have to be modified at times in response to changing seasonality patterns or other factors influencing the over-all quantities of surplus milk the market must carry. The limited analysis made in this study suggests no general criticism of the standard ratios in use in Midwestern markets.

The mechanism that moves a supply-demand adjuster should provide a dependable indicator of *important* changes in the relationship between producer receipts and Class I sales. To do this, the mechanism must be little affected by fluctuations in the relationship that represent (1) changes in the seasonal pattern, (2) transitory deviations and (3) the effects of illusory changes (such as those caused by differences in the proportion of late-in-the-week days — when sales are heavy — included in the base period).

In considering the effect of length of the base period of its mover on the behavior of the adjuster, two other points should be kept in mind. Any change that affects a 12-month mover shows up in the adjustment over a considerably longer period than does the more pronounced change in the adjustment caused by a 2-month mover. Likewise, if the change is the initial indication of a trend to which prices should respond, there is merit in having a prompt and appreciable price adjustment. While a short-base mover makes such a response, it does not, however, distinguish important changes from the many unimportant, and sometimes illusory, changes that show up in the relationship between producer receipts and Class I sales.

Changes in seasonality patterns are bothersome with adjusters that use base periods of less than one year, and should be deemphasized. In extreme cases they show up in contraseasonal adjustments. Short of that, changes in the seasonality pattern of the relationship add to fluctuations in the adjuster because of inability to keep norms used in computing the mover in full conformity with them. Moving seasonality

indexes, as used in the New York-New Jersey order and in the Southern Michigan order, have helped to cope with this problem. However, the computations involved are complex, and moving seasonal indexes will not fully keep up with all changes in seasonality patterns, particularly drastic ones. Adjusters that use 12-month bases largely avoid the problem of changing seasonality patterns without involving complex computations.

Adjusters with 2-month bases reflect the effects of short-term fluctuations in the receipts-Class I sales relationship, and also of illusory changes such as those due to differences in the number of late-in-the-week periods included in different 2-month intervals. If predictable, fluctuations of these types can be taken care of by computed adjustments, though they complicate provisions for the adjuster. The effects of unpredictable short-term fluctuations inevitably show up in movers that use such short base periods as two months. With such movers, the only practical way to deal with the problem involves finding ways to soften their impact on prices. In contrast, a mover with a 12-month base is little affected by short-lived changes of these types. Rather, the 12-month base emphasizes the long-term aspects of the receipts-Class I sales relationship which usually are of fundamental concern.

Further options in the adjuster mechanism are available to determine how changes in the mover are converted into price adjustments. These options include the rate of adjustment per point of deviation, use of an accelerator or accumulator, choice between adjusting at an equal rate per point of change or by brackets, use of a tolerance zone, and limits to adjustments. By using proper options, adjustments from a 2-month mover may be modified in the direction of adjustments from a 12-month mover, and vice versa. On the whole, the length of the base period used has such a pronounced effect on the behavior of the adjuster that the behavior of neither the 2-month mover nor the 12-month mover is likely to be modified sufficiently to wipe out its distinctive differences from the other.

No conclusive evidence was obtained in this study as to the comparative effectiveness of adjusters with 2-month and 12-month bases in keeping receipts reasonably in line with Class I sales. Lacking such information, it appears that in practice the goal in making price adjustments is to attain a reasonable balance between responsiveness and stability. The price adjustment should respond to important changes in the relationship of milk supplies to fluid use. In doing this, it should indicate the general state of the relationship accurately and with

enough consistency to guide producer organizations and handlers effectively in making adjustments. Persistency and stability also are desirable to make it feasible to forecast prices,[1] to smooth out intermarket price relationships, and to minimize the number of large changes that, under some conditions, may tempt marketing agencies to try to influence adjuster operations for their own gain.

With some 2-month movers, accumulators have been used to reduce the extremity of the resulting price adjustments. In moderating the extremes in fluctuations, the accumulator reduces, but does not eliminate, the instability that results from use of a 2-month base. Use of a tolerance zone, either by itself or with an accumulator, cuts down the extremity of price adjustments without changing their fundamental character.

Roughly speaking, the reverse effect is obtained by using an accelerator with a 12-month mover. This modification increases the responsiveness of such an adjuster to changing conditions without seriously detracting from the essential stability in its price effects that results from using the longer base period.

Behavior of an adjuster conceivably may be modified by changing rates of adjustment or limits. This apparently has not been general practice. Schedules for bracket adjustments in a few cases vary rates of adjustment with the amount of deviation. However, a more important concern with bracket adjustments is whether, by setting up schedules in which there are comparatively large changes in price, they increase temptation to try to influence the price by interfering with the operation of the adjuster.

All in all, the choice between a 2-month and a 12-month base usually affects adjuster operations most drastically. Although the effects of each may be modified, the choice between them is a major determinant of the degree of fluctuation in the adjuster. The choice generally appears to depend on the relative emphasis desired to be given to the over-all changes in the receipts-Class I sales relationship, and to the numerous short-term changes in the relationship. When making that decision, it is well to bear in mind that, unless guarded by complicated adjustments, a mechanism that responds to short-term changes is not selective. Thus it responds to changes that reflect shifts in seasonality patterns and to changes associated with day-of-the-week fluctuations in sales of packaged milk as well as to fundamental changes in the relationship between producer receipts and Class I sales.

[1] In Chicago, for example, reliable twice-a-year forecasts of prices for 6-month periods have been made regularly in recent years. Such forecasts help producers and marketing agencies to plan intelligently for future operations.

APPENDIX

Behavior of Accelerators and Accumulators

An accelerator is commonly used with a supply-demand adjuster that has a 12-month base to make it more sensitive to developing trends than a straight 12-month moving average. The device used in Chicago is an illustration. This accelerator affects prices in other markets in the Chicago area, including Milwaukee, and operates in the same manner as the accelerator employed in St. Louis.

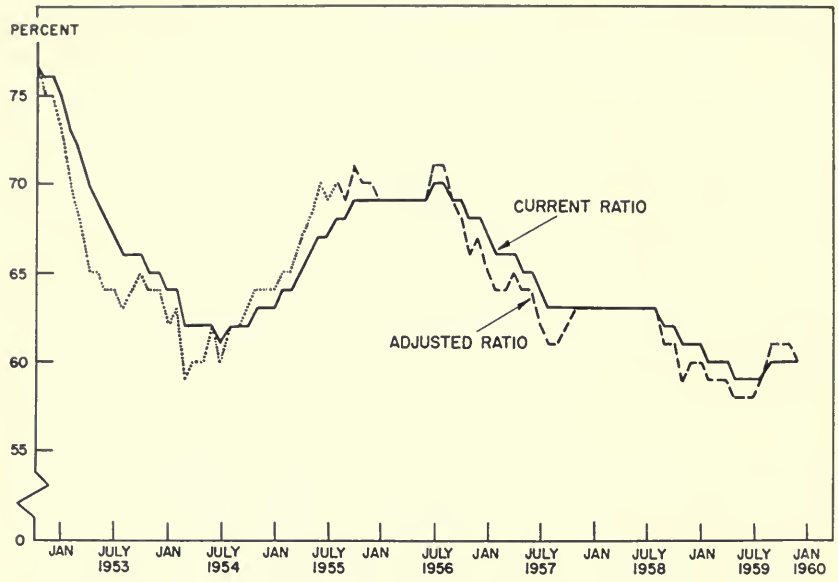
An accelerator has been used in calculating the supply-demand adjustment in Chicago since August 1, 1955. It is computed by comparing the 12-month moving average ratio used for the current month with the corresponding ratio for the third preceding month. If the current month's ratio is higher, the difference is added to the current ratio in computing the adjustment; if it is less, the difference is subtracted. The ratio that reflects the effect of the accelerator is termed the "adjusted ratio," while the straight 12-month moving average is termed the "current ratio."

To study the effect of the accelerator over a longer period, the behavior of the adjusted ratio is compared with that of the current ratio for the period September, 1952-July, 1955, before the accelerator was effective, as well as in the period since then. This illustrates that in periods of upswings and of downswings of the 12-month moving average, the adjusted ratio is more responsive than the current ratio (Fig. 13). On the other hand, in periods of stability, as in early 1956 and early 1958, the two ratios may be identical even though they are not at the prescribed standard level.

A closer look at the effect of the accelerator may be based on data for 1958. The 12-month moving average ratio of Class I and Class II sales to producer receipts declined in the latter half of 1958 after being stable during the first half of 1958. To show more precisely when changes in the ratio occurred, the graph shows individual monthly ratios as deviations from the eight-year average (1952-1959) monthly ratios.[1] Starting in June, the 1958 monthly ratios dropped sharply relative to the eight-year average ratios until October (Fig. 14). Reflecting this decline, the current ratio for the 12 months that ended in July was one point below that for the previous month.[2] With this drop

[1] In computing the Chicago adjuster, the effects of seasonal changes are eliminated by using 12-month moving averages.

[2] In practice, the current and adjusted ratios used in pricing are those for the 12-month periods that ended two months prior to the pricing month. To show relationships more clearly, this 2-month lag was eliminated in constructing the graph.



Relationship of current 12-month moving average ratio of fluid milk sales to producer receipts to the corresponding adjusted ratio that reflects the influence of the accelerator, Chicago, 1952-1959. (Accelerator became effective August 1, 1955; adjusted ratio before that date is hypothetical.) (Fig. 13)

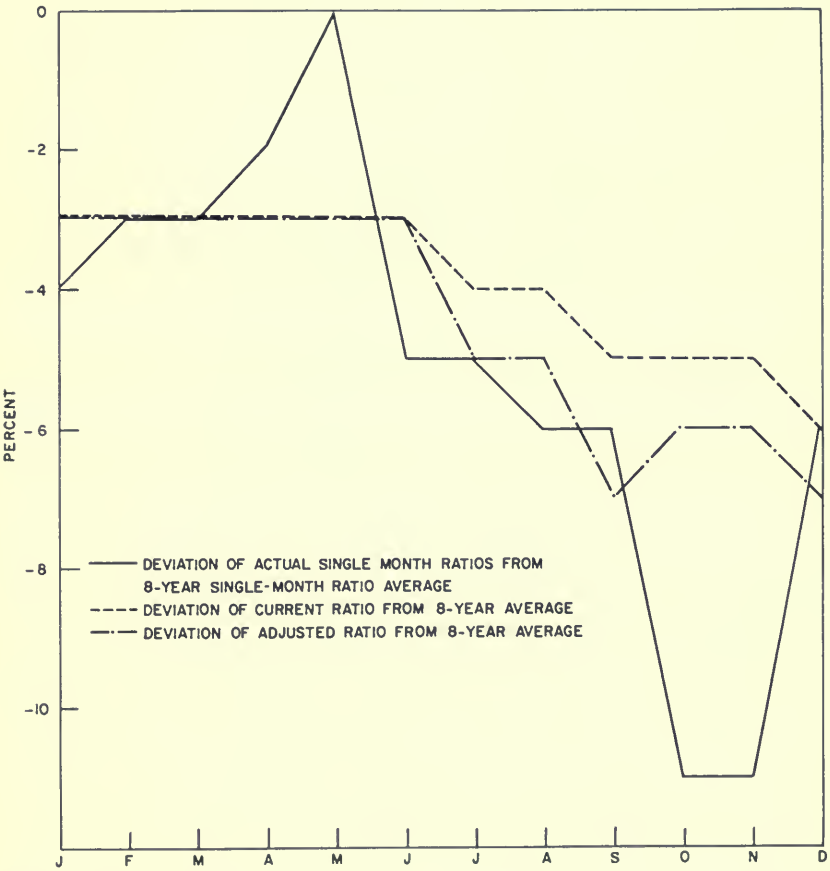
in the current ratio, the accelerator moved the adjusted ratio down a second point. There was a similar difference in August. By September the current ratio had dropped another point, and the accelerator moved the adjusted ratio down two additional points. In subsequent months, the current 12-month moving average ratio did not continue to decline as sharply, with the result that for the remaining months of the year the accelerator pulled the adjusted ratio only one point below the current ratio.

Three points are brought out by this analysis:

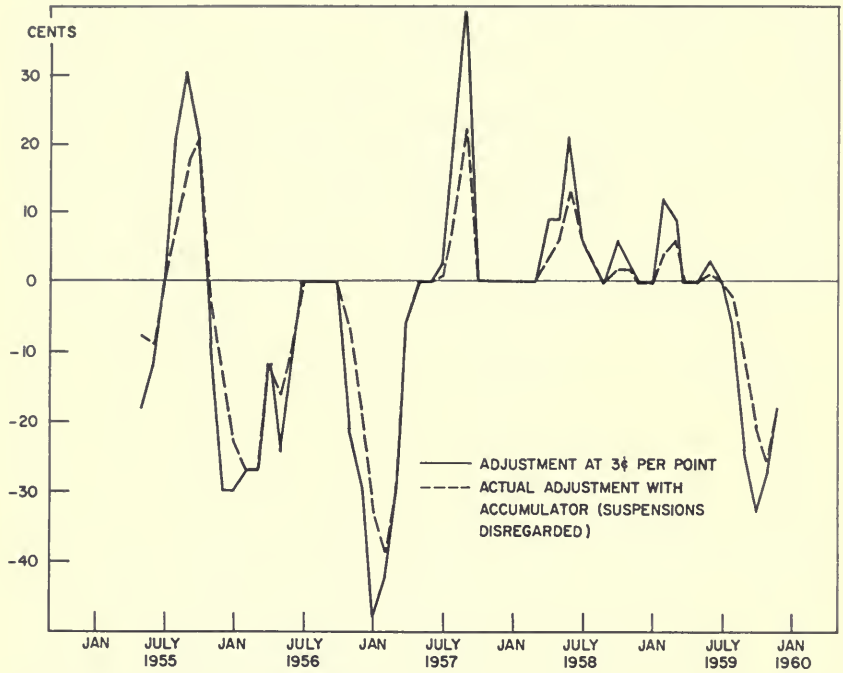
1. The adjusted ratio, which reflects the effect of the accelerator, does not change until the 12-month moving average changes. While use of an accelerator may amplify the amount of change in the adjuster, it does not make it respond sooner.

2. With the 12-month base, the Chicago adjusted ratio, which reflects the effects of the accelerator, fluctuates much less from month to month than individual monthly ratios. In other words, with a 12-month base the monthly ratios can deviate considerably from normal for several months without getting a pronounced reaction from the accelerator.

3. With a continuing trend, either up or down, in the current 12-month average ratio, the accelerator will cause the adjusted ratio to differ from the 12-month average. If the 12-month average does not change over the interval used in computing the accelerator, the latter will have no effect even if the ratio is considerably above or below normal. With the 3-month interval involved in computing the accelerator, the adjusted ratio involves a lag that may make it move deceptively for a month or two at the time of a change in the direction of the trend in the current ratio. This is not, however, a serious fault.



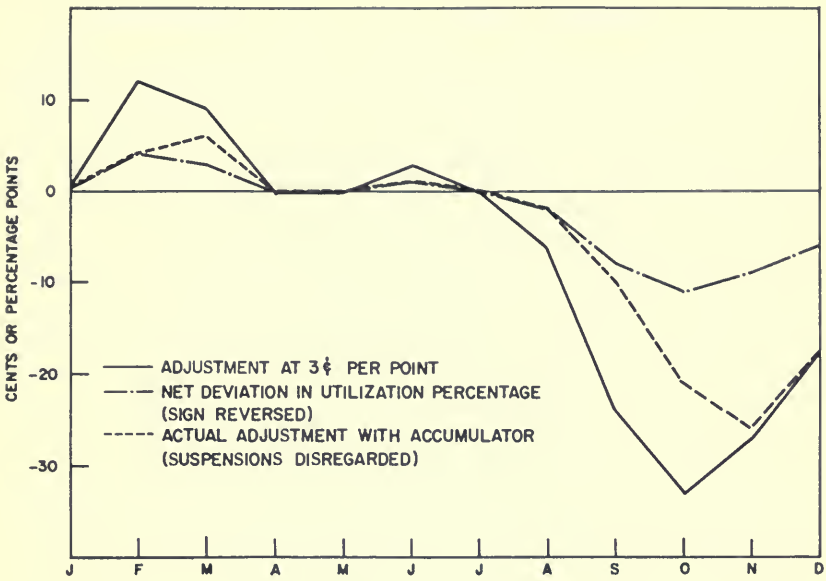
Relationships of current 12-month moving average ratio and adjusted ratio that incorporates effect of the accelerator to deviations in single month supplies-sales ratios, all expressed as deviations from 8-year averages, Chicago, 1958. (To show relationships more clearly, current and adjusted ratios are advanced two months to eliminate lag.) (Fig. 14)



Relationship between actual supply-demand adjustment with an accumulator and a hypothetical adjustment if computed at straight 3 cents per point, Kansas City, May, 1955-December, 1959. (Fig. 15)

A device that somewhat resembles the accelerator used in Chicago has been used in some markets where the adjuster has a 2-month base. In Kansas City this type of device, termed an "accumulator," went into effect on May 1, 1955. With the accumulator, the price adjustment per point of deviation[1] of the latest receipts-Class I sales ratio used in pricing a given month's milk was limited to one cent. A second cent, however, was added for each point of deviation in the same direction in the month immediately preceding. In addition, a third cent was added for each point of deviation in the same direction that occurred in both the first and second months immediately preceding.

[1] The phrase "per point of deviation" refers to deviations of a particular supplies-sales ratio from the standard with which it is compared. Thus a current ratio of 148 would deviate by 8 points from a standard ratio of 140. If the standard involves a tolerance zone, deviation would be from the nearest "edge" of that.



Relationship of actual supply-demand adjustment with an accumulator and a hypothetical adjustment at straight 3 cents per point to net deviations in utilization percentage (with sign reversed), Kansas City, 1959. (Fig. 16)

The behavior of the adjuster as computed with an accumulator is compared with the behavior of an adjuster computed on the basis of a straight 3 cents per point of deviation of the latest receipts-Class I sales ratio used in pricing the month's milk (Fig. 15). Though fluctuating less widely than the other, the adjuster based on the accumulating rate is comparatively sensitive, particularly as it moves back to or toward zero.

In a more intensive comparison, the actual supply-demand adjustment in Kansas City, using an accumulator and the hypothetical adjustment at a straight 3 cents per point, are related to monthly deviations in the receipts-Class I sales ratio in 1959.[1] This comparison also demonstrates the stabilizing effect of the accumulating device as contrasted with adjustments computed at the maximum rate per point that can build up under the accumulating adjustment (Fig. 16). Thus, in

[1] Deviations from the supplies-sales ratio are graphed with signs reversed so the line portraying that relationship will move in the same direction as the supply-demand adjustment when conditions change.

reality, the accumulator serves as a decelerator rather than as an accelerator.

The accumulator exerts a moderating influence when the adjuster increases positively or negatively. It does not slow down changes back toward or to zero. Because peaks in both positive and negative adjustments may be reduced, changes back toward or to zero, though not retarded, are likely to be smaller in amount.

The accumulator also differs from the accelerator used with a 12-month base in that the adjustment is maximized by a deviation that persists from month to month at a uniform rate, while the accelerator has maximum effect in periods of change in the relationship. Since it is used with a 2-month base, the accumulator is designed to moderate fluctuations in the adjustment in times of changing conditions.

Although the accumulator moderates changes, it does not eliminate the short-term fluctuations in the adjustment that result from using a 2-month base. It is shown on pages 46-49 that even with the use of the accumulator, the Kansas City adjuster fluctuated much more widely than an adjuster that involved a 12-month base and an accelerator.

SUMMARY

Supply-demand adjusters are among the mechanisms used in federal order markets to adjust prices paid to farmers for milk in response to changes in the relationship between receipts of milk from producers and the quantity used in fluid milk, cream, and other fluid products. The adjusters respond to local changes in the producer receipts-Class I (and in some markets also Class II) sales relationship in the various federal order markets. They raise prices to producers when receipts of milk fall below specified ratios to Class I sales, and reduce prices when receipts exceed those ratios. In November, 1960, independently computed adjusters were used in 15 of the 40 federal order markets in the Midwest, and Class I prices in 10 other federal order markets in the region were indirectly affected by them.

This study was made to describe types of adjusters used in the North Central Region, to examine their performance and its relation to characteristics of the adjusters, and to provide other information that will be helpful in specifying provisions for an adjuster for a particular market.

The United States Department of Agriculture has used supply-demand adjusters as an aid in complying with the interpreted intent of the Agricultural Marketing Agreement Act to establish prices for milk for fluid use that reflect conditions affecting supplies and consumption in individual markets.

The extent to which a supply-demand adjuster affects the balance between milk receipts and Class I sales in a market appears to depend largely on its effectiveness in shifting milk between the fluid market concerned and alternative outlets. Indication of such shifts was found in the outer zones of the Chicago milkshed. The quantity of milk supplied to the Chicago pool by plants in that area varied considerably in response to changes in the differential above manufacturing prices reflected in returns from the Chicago market. In large measure, the changes in the volume of milk received in the Chicago pool from these zones were brought about by plants shifting into and out of the Chicago market. Shifts of this type possibly are less pronounced where milk prices are farther above manufacturing price levels than they were in this area of northwestern Wisconsin.

The effect of an adjuster on price is influenced by the ratio used as a standard, by the width of the tolerance zone allowed around that standard, if any, and by the rate of and limits to adjustment. Its behavior also depends on the length of the base period, on whether the ratio is computed by dividing receipts by Class I sales or vice versa, and on whether an accelerator or accumulator is employed. The adjusters used in Midwestern markets vary widely in these and other characteristics.

Adjuster operation was studied in detail in six markets — Chicago, Detroit (now Southern Michigan), St. Louis, Cleveland (now Northeastern Ohio), Kansas City, and Minneapolis-St. Paul. The adjusters in these markets exhibited much of the diversity in characteristics and behavior of all adjusters used in the region. Supply-demand adjustments in some cases amounted to 20 percent or more of the Class I differential, but they commonly amounted to less than 5 percent of the Class I price, and to less than 4 percent of the blend price.

A major purpose of adjusters is to help maintain a normal ratio of producer receipts to Class I sales on a year-round basis. This normal relationship varies among markets. It has commonly been based on past experience, and so has taken into account the proportion of surplus milk that has been characteristic of the market.

In computing supply-demand adjustments, standard utilization percentages are used to indicate this basic relationship between producer receipts and Class I sales. If seasonal or day-of-the-week surpluses change considerably in magnitude, these percentages may need to be modified. However, only one-fifth of the Midwestern markets having independently computed supply-demand adjusters in November, 1960, then had average annual standard utilization percentages that differed by more than five points from those initially used.

Adjusters in the six markets varied widely in sensitivity to changes in the ratio of producer receipts to Class I sales. The two adjusters using 12-month bases, especially the Chicago adjuster, did not respond as greatly to changes in the receipts-Class I sales relationship as did those adjusters using 2-month bases. The latter were sensitive to transitory fluctuations in the relationship of supplies to fluid sales. Some of these short-term fluctuations were due to variations in numbers of early-in-the-week and late-in-the-week periods in different 2-month intervals. Fluctuations attributable to differences in the numbers of these periods included in the comparison should not affect price.

Differences between 2-month and 12-month bases in responsiveness to changes in the ratio of producer receipts to Class I sales are primarily in the extent and duration of the response. Short-base adjusters respond more sharply, and the response is shorter in duration than that of long-base adjusters. Though the immediate effect is less, an adjuster with a 12-month base will be affected by any significant deviation from the normal relationship of producer receipts to Class I sales which, if not offset by other changes, will continue to affect it for a year. Over a 12-month period, however, offsetting changes are more likely to occur than over a 2-month period. The greater sensitivity of adjusters with 2-month bases does not assure that price adjustments necessarily will come when they are most needed. Moreover, such adjustments may be too short-lived to allow time for much of a response to take place in supplies. Nevertheless no evidence was found that producer receipts were in better balance with Class I sales in markets with adjusters that used 12-month bases than in markets with adjusters that used 2-month bases.

Contraseasonal changes have not been troublesome with adjusters that use a 12-month base. However, despite periodic changes in the monthly schedule of standard utilization percentages, contraseasonal changes and fluctuations that reflect inadequacies in the seasonal factors used have been a problem with some adjusters that use 2-month bases. With these adjusters the problem can be eased, though not eliminated, by the use of moving indexes of seasonality.

Supply-demand adjustments contributed to fluctuations in intermarket Class I price differences in the majority of the intermarket price comparisons made. In some cases, adjustments rather persistently increased or decreased the size of the intermarket price differential. Continuing minus supply-demand adjustments apparently were one of the factors that induced several plants in northwestern Wisconsin to take all or part of their milk out of the Chicago pool in the mid-1950's.

Three of these plants shifted milk to the Minneapolis-St. Paul market.

Marketing firms may make responses to adjusters other than those intended by the USDA. In recent years negotiated premiums above federal order prices have been obtained most of the time in Chicago and Detroit, and to a lesser extent in the other markets studied. In most instances when premiums were obtained, adjusters were deducting from the Class I price and the premiums offset, or more than offset, the effects of the adjusters. In such cases, producer groups nullified the effects of negative supply-demand adjusters through negotiation with handlers. One of the other possibilities, being exploited in one of the six markets, is that producer organizations may hold milk off the market to add to the adjustment. Another possible approach is to request the suspension of large negative adjustments. Few suspensions, however, have been granted in markets studied.

Supply-demand adjusters can also be affected by the activities of handlers. When handlers operate plants in two or more markets, the shifting of supplies between these plants can affect the supply side of the market. Large handlers can also affect the demand side of the market by altering sales promotion activities or shifting the source of milk for out-of-area sales when more than one source is available.

To demonstrate the relation of the mechanism of an adjuster to its behavior, the movements of six adjusters were tested using data for Kansas City in a period of wide changes in the relationship of producer receipts to Class I sales. Under these conditions, an adjuster using a simple 2-month mover fluctuated widely. An accumulator reduced the extremes of these fluctuations, as did standard utilization percentages that used moving indexes of seasonality. A 12-month base, however, was sufficiently more stable than a 2-month base that the adjuster using it was least erratic, even when it was used in conjunction with an accelerator. If an adjuster is used, it is desirable for it to respond promptly and decisively to an important change in the relationship of producer receipts to Class I sales, including a change which is the initial indication of a developing trend in that relationship. However, a 2-month base, which gives such a response, has the disadvantage of reflecting, in excessive fluctuations in the adjustment, many short-term changes in the relationship that are of little or no significance, including some which result merely from day-of-the-week fluctuations in sales.

This study suggests tentative criteria for consideration in determining the mechanics of a supply-demand adjuster. The suggestions assume adjusters were adopted to help maintain an acceptable over-all balance between supplies of milk from producers and Class I sales.

To accomplish this, the mechanism that moves an adjuster should provide a dependable indication of *important* changes in the relationship between producer receipts and Class I sales. This indication should be little affected by changes in the seasonal pattern of that relationship, or by transitory or illusory fluctuations in the relationship.

Options in the adjuster mechanism, such as moving seasonality indexes and adjustments for differences in the number of late-week periods for use in conjunction with 2-month movers, an accelerator or accumulator, or a tolerance zone, modify the effect of the mover on price. By careful selection of options, the adjustment obtained from a 2-month mover may be modified in the direction of the adjustment obtained from a 12-month mover, and vice versa. Nevertheless the difference in response of movers involving these two commonly used base periods is so pronounced that the choice between them is likely to be a major factor influencing the behavior of the adjuster.

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